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EX4400 Switch Hardware Guide

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EX4400 Switch Hardware Guide

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the EX4400 switch. After completing the installation and basic configuration procedures covered in this guide, refer to the Mist Wired Assurance documentation to learn more about configuration and management of the switch. You can refer Junos OS documentation also for more information about software configuration using the Junos OS CLI.

1

CHAPTER

Fast Track: Initial Installation

Fast Track to Rack Installation and Power

SUMMARY

This procedure guides you through the simplest steps for the most common installation to get your EX4400 switch in a rack and connect it to power. Have more complex installation needs? See "Install the EX4400 Switch" on page 142 .

IN THIS SECTION

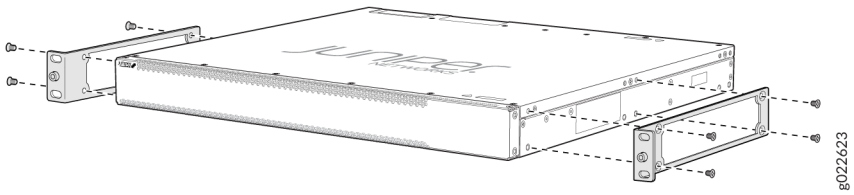
Install the EX4400 in a Rack

You can install the EX4400 switch on a desktop or other level surface, in a two-post or four-post rack, or on a wall. We'll walk you through the steps to install an AC-powered switch in a two-post rack.

Before you install, review the following:

- "EX4400 Site Guidelines and Requirements" on page 117 .
- General Safety Guidelines and Warnings.
- "Packing List for an EX4400 Switch" on page 143 .

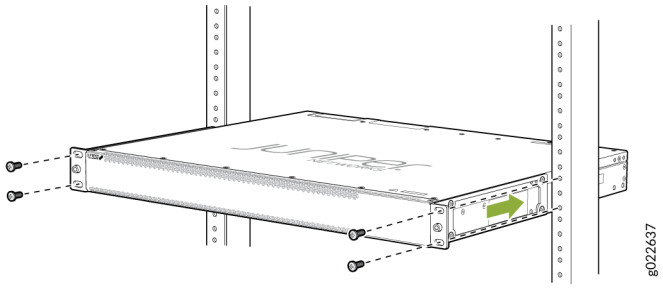
1. Place the switch on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end to a site ESD point.
3. Attach the mounting brackets to the sides of the EX4400 switch using the eight screws in the rack mount kit and a screwdriver.



4. Lift the switch and position it in the rack. Position the switch so that the AIR IN labels on the fan modules are facing the cold aisle, or the AIR OUT labels on the fan modules are facing the hot aisle.

Line up the bottom hole in each mounting bracket with a hole in each rack post, making sure the switch is level.

5. While you're holding the switch in place, have a second person insert and tighten the rack mount screws to secure the mounting brackets to the rack posts. Tighten the screws in the two bottom holes first, and then tighten the screws in the two top holes.



6. Check that the mounting brackets on each side of the rack are lined up with each other.

7. Cover the empty extension module and the power supply slots by using the covers that came with the switch.

Connect to Power

IN THIS SECTION

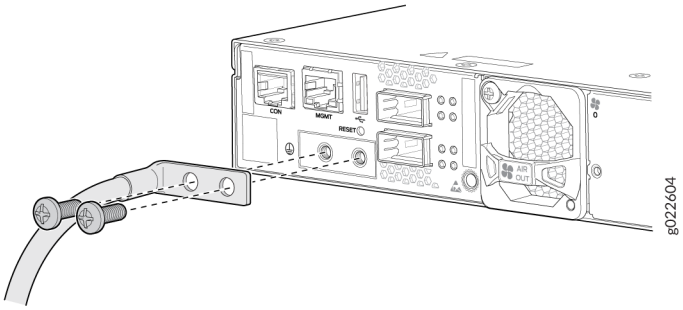
To connect the EX4400 switch to AC power, you must do the following:

Ground the EX4400 Switch

To ground the EX4400 switch, do the following:

1. Connect one end of the grounding cable to a proper earth ground, such as the rack.

2. Place the grounding lug attached to the grounding cable over the protective earthing terminal on the rear panel.



3. Secure the grounding lug to the protective earthing terminal using the 10-32 x .25-in. screws with #10 split-lock washers.

4. Dress the grounding cable. Be sure that the cable doesn't block access to or touch other device components, and that it doesn't drape where people could trip over it.

Connect the Power Cord and Power On the Switch

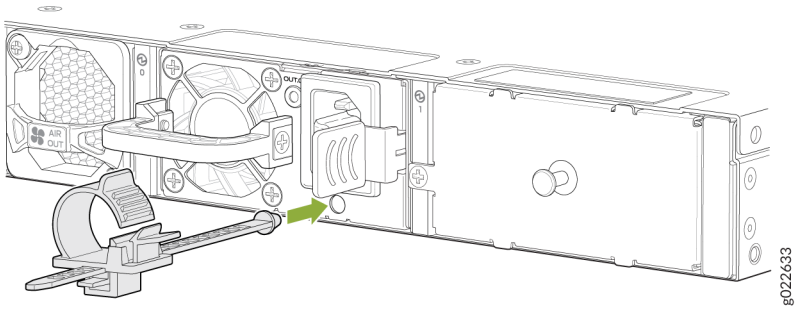
For information about the supported AC power cord specifications, see Table 44 on page 92 .

To connect the power cord, do the following:

1. Ensure that the power supply is fully inserted in the rear panel of the switch.

2. On the rear panel, connect the retainer strip and power cord to the AC power socket:

   a. Push the end of the retainer strip into the hole next to the AC power socket until it snaps into place. Ensure that the loop in the retainer strip points upward.



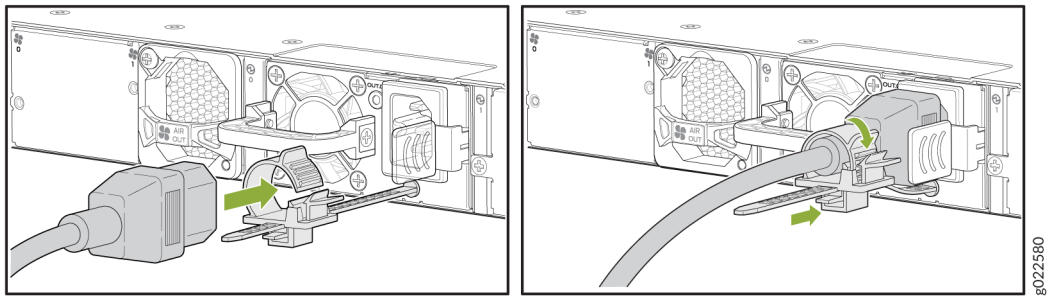
   b. Press the small tab on the retainer strip to loosen the loop.

c. Slide the loop until you have enough space to insert the power cord into the AC power socket.

d. Firmly plug in the power cord to the AC power socket on the switch.

e. Slide the loop toward the power supply until it is snug against the base of the power cord coupler.

f. Press the tab on the loop, and draw out the loop into a tight circle.



3. If the AC power source outlet has a power switch, turn it off.
4. Plug in the power cord to the AC power source outlet.
5. If the AC power source outlet has a power switch, turn it on. The switch powers on as soon as you plug it in. The EX4400 doesn't have a power switch.
6. Check to see that the OUT.OK LED on the power supply is lit steadily green. If not, disconnect the power supply from the power source. You'll need to replace the power supply (see Maintain the EX4400 Power System in the EX4400 Switch Hardware Guide).

Claim, Onboard, and Configure EX4400

SUMMARY

This topic provides you the pointers to onboard and configure EX4400 switches using Mist, or configure EX4400 switches using Junos CLI.

EX4400 switch is a cloud-ready switch, and you can manage this switch using Mist AI cloud portal. If you have a Mist Wired Assurance license, you can follow a few simple steps to get an EX4400 up and running in the Juniper Mist AI cloud portal. See Table 1 on page 6 for more information.

Table 1: Onboard and Configure EX4400 Using Mist

If you want to	Then
Claim and Onboard to Mist	See Cloud-Ready EX and QFX Switches with Mist
Configure Wired Assurance	See Juniper Mist Wired Configuration Guide
See all documentation available for Wired Assurance	Visit Wired Assurance Documentation

If you do not have a Mist Wired Assurance license, you can configure EX4400 using Junos CLI. See Table 2 on page 6 for more information.

Table 2: Configure EX4400 Using Junos CLI

If you want to	Then
Customize basic configuration	See "Configure Junos OS on the EX4400" on page 178
Explore the software features supported on EX4400	See Feature Explorer
Configure Junos features on EX4400	See User Guides

2

CHAPTER

System Overview and Specifications

EX4400 System Overview

SUMMARY

Learn about the key features and benefits, models and specifications, and FRUs and extension modules of EX4400 switches.

IN THIS SECTION

EX4400 Ethernet Switch

IN THIS SECTION

The Juniper Networks® EX4400 line of switches are a family of secure and cloud-ready access switches suited for enterprise branch, campus, and data center networks. EX4400 switches offer a strong hardware foundation with best-in-class security in combination with the simplicity of the cloud and the power of Mist AI. You can use Juniper Mist Wired Assurance to onboard, configure, and manage EX4400 from the cloud with minimal effort. You can manage EX4400 switches by using the CLI or J-Web also.

These are the key hardware features of EX4400 switches:

- Quad-core x86 CPU, 4-GB DDR4 memory with support for error correction code (ECC), and 20-GB eMMC storage

- PoE models (EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP) support IEEE 802.3bt Power over Ethernet (PoE-bt), fast Power over Ethernet (PoE), and Perpetual PoE
- Hot-swappable AC or DC power supplies. We ship EX4400 switches with one AC or DC power supply. Order an additional power supply and power cord separately if you need 1+1 redundancy. For more information about the EX4400 power system, see EX4400 Power System
- Dual hot-swappable fan trays that provide front-to-back or back-to-front airflow. For information about the cooling system and airflow in an EX4400, see Cooling System and Airflow in an EX4400 Switch
- A slot to install an optional extension module. See "Extension Modules in EX4400 Switches" on page 11 for more details

For information about the software features supported on EX4400, see Feature Explorer.

Table 3: Hardware Overview Videos

Video: EX4400 Switches	**Video:** Multigigabit EX4400 Switches	**Video:** EX4400-24X Switches

Benefits of the EX4400 Switch

Cloud readiness—EX4400 switches are our first cloud-ready switches. You can deploy the switches and manage them by using Juniper Mist.

Support for Virtual Chassis—EX4400 switches support Virtual Chassis technology. You can interconnect up to 10 EX4400 switches to form a Virtual Chassis.

Support for channelization—You can channelize the QSFP28 ports on the EX4400 switch and increase the number of interfaces.

Support for MACsec and EVPN-VXLAN architecture—EX4400 switches support IEEE 802.1AE Media Access Control Security (MACsec) and EVPN-VXLAN. Support for MACsec and EVPN-VXLAN ensures link-layer data confidentiality, data integrity, and data origin authentication to help secure deployments in enterprise multicloud deployments. On the EX4400 switches, the MACsec AES-256 encryption capability is supported on all RJ-45, SFP, and SFP+ network ports. MACsec AES-256 is supported on the SFP28 ports of the 25GbE (EX4400-EM-4Y) and the QSFP28 ports of the 100GbE (EX4400-EM-1C) extension modules. EX4400-24X supports MACsec AES-256 on the native front-panel 100GbE ports as well.

Support for IEEE 802.3bt Power over Ethernet (PoE-bt)—The RJ-45 ports in EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP switches support IEEE 802.3bt (PoE-bt), providing power of up to 90 W per port. These ports also support **fast PoE** and **Perpetual PoE**.

Compact solution—The EX4400 switch is a modular single rack unit (1-U) device that is an apt solution for crowded wiring closets and access switch locations. The switch provides carrier-class reliability of modular systems with the economics and flexibility of stackable platforms.

High availability—EX4400 switches provide high availability through redundant power supplies and fans, graceful Routing Engine switchover (GRES), and nonstop bridging (NSB) and nonstop active routing (NSR) when deployed in a Virtual Chassis configuration.

EX4400 Switch Models

EX4400 line of switches consist of both PoE and non-PoE models and multigigabit port models. These switches run on either AC or DC power and support either back-to-front or front-to-back airflow. Table 4 on page 10 provides a summary of the EX4400 switch models. Click on each link in the table to find more information about the model.

Table 4: EX4400 Switch Models

Non-PoE Models	PoE Models	Multigigabit Models
"EX4400-24T" on page 21	"EX4400-24P" on page 17	"EX4400-24MP" on page 52
"EX4400-24X" on page 28	"EX4400-48P" on page 41	"EX4400-48MP" on page 56
"EX4400-48T" on page 45		
"EX4400-48F" on page 34		

Virtual Chassis

You can use the quad small form-factor pluggable 28 (QSFP28) ports to interconnect a maximum of 10 EX4400 switches to form a Virtual Chassis. On EX4400 switch models except EX4400-24X, the QSFP28 ports are on the rear panel. On the EX4400-24X model, the QSFP28 ports are on the front panel.

On EX4400 switch models except EX4400-24X, the QSFP28 ports are configured as Virtual Chassis ports (VCPs) by default. Each of the two QSFP28 ports operates as two logical 50-Gbps VCP interfaces. On the EX4400-24X model, you can configure the QSFP28 ports as VCPs by using the `request virtual-chassis mode network-port` CLI command.

You can operate the interconnected switches as a single, logical device with a single IP address. For more information about Virtual Chassis, see *Understanding EX Series Virtual Chassis*.

You can configure the QSFP28 ports as network ports and operate them as 100GbE network ports or uplink ports by using QSFP28 transceivers and by using the CLI command `request virtual-chassis mode` .

Field-Replaceable Units in EX4400 Switches

Field-replaceable units (FRUs) are components that you can replace at your site. The FRUs in EX4400 switches are hot-removable and hot-insertable: You can remove and replace them without powering off the switch or disrupting switch functions. The following are the FRUs in EX4400 switches:

- Power supplies
- Fan modules
- Extension modules
- Transceivers

NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Extension Modules in EX4400 Switches

EX4400 switches provide a slot to install an optional extension module. Extension modules are hot-insertable and hot-removable field-replaceable units (FRUs): You can remove and replace them without powering off the switch or disrupting switch functions.

You can install an extension module horizontally in the extension module slot on the front panel of the switch. You can use the ports on the extension module to connect the switch to other devices. By installing an extension module, you add more ports to your switch, thereby increasing the port density of the switch.

Table 5 on page 12 shows the extension modules supported on EX4400 switches, their descriptions, and the first Junos OS release the extension modules support.

Table 5: Extension Modules Supported on EX4400 Switches

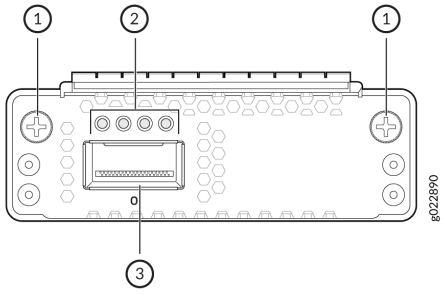
Extension Module	Description	First Junos OS Release
1x100GbE QSFP28 extension module (model number: EX4400-EM-1C)	The 1x100GbE QSFP28 extension module supports Media Access Control Security (MACsec) with AES-256 encryption. You can install one 40GbE QSFP+ transceiver or one 100GbE QSFP28 transceiver in the extension module. You can channelize the port on the extension module to support 10-Gbps and 25-Gbps speeds by connecting a breakout cable and by using CLI configuration. **Figure 1: 1x100GbE QSFP28 Extension Module for EX4400 Switches**  1– Captive screws 2– LEDs 3– QSFP28 port	23.1R1 **NOTE**: EX4400 switches except EX4400-24X require System CPLD Firmware 1.0 or later installed in them to support the 1x100GbE QSFP28 extension module. EX4400-24X switches require System CPLD Firmware 0.6 or later installed in them to support the 1x100GbE QSFP28 extension module. See *Installing and Upgrading Firmware* and for steps to upgrade the firmware.

Table 5: Extension Modules Supported on EX4400 Switches *(Continued)*

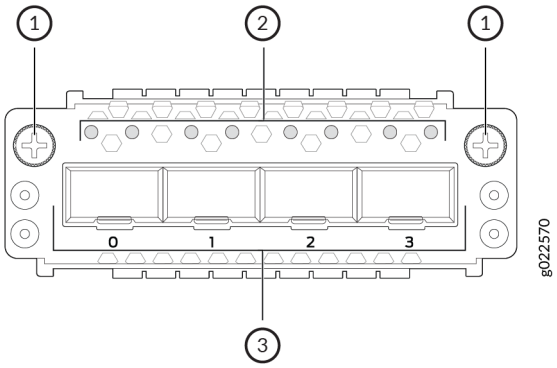
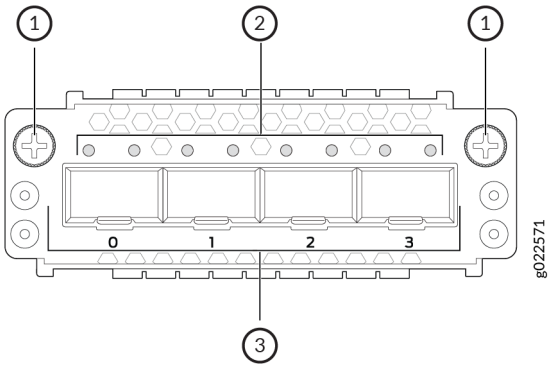
Extension Module	Description	First Junos OS Release
4x10GbE SFP+ extension module (model number: EX4400-EM-4S)	You can install up to four 1GbE SFP transceivers or 10GbE SFP+ transceivers in the 4x10GbE SFP+ extension module. Do not install SFP transceivers and SFP+ transceivers in the extension module at the same time. **Figure 2: 4x10GbE SFP+ Extension Module for EX4400 Switches**  1– Captive screws 2– LEDs 3– SFP+ ports	21.1R1

Table 5: Extension Modules Supported on EX4400 Switches *(Continued)*

Extension Module	Description	First Junos OS Release
4x25GbE SFP28 extension module (model number: EX4400-EM-4Y)	The 4x25GbE SFP28 extension module supports Media Access Control Security (MACsec) with AES-256 encryption. You can install up to four 10GbE SFP+ transceivers or four 25GbE SFP28 transceivers in the extension module. Do not install SFP+ transceivers and SFP28 transceivers in the extension module at the same time. **Figure 3: 4x25GbE SFP28 Extension Module for EX4400 Switches**  1– Captive screws 2– LEDs 3– SFP28 ports	21.1R1

Extension modules and transceivers are not part of the shipping configuration. You must order them separately.

When you install an extension module in the switch or replace an extension module with another extension module, the switch detects the extension module. The output of the `show chassis pic fpc-slot` *`slot number`* `pic-slot` *`slot number`* command displays the operating speed of the extension modules. You must configure the extension module to operate at the speed of the transceiver that you plan to install in the extension module. The switch detects the transceiver that you install in the extension module port and displays the transceiver details in the output of the `show chassis hardware` command.

The 1x100GbE QSFP28 extension module operates in 100-gigabit mode by default. It operates in 40-gigabit mode if you insert a 40GbE QSFP+ transceiver. When the extension module is operating in 100-gigabit mode, you can channelize the port and configure it to operate in 25-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 channel-speed 25g` command and a 4x25GbE breakout cable. When the extension module is operating in 40-gigabit mode, you can channelize the port and configure it to

operate in 10-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 channel-speed 10g` command and a 4x10GbE breakout cable.

The 4x25GbE SFP+ extension module operates in 25-gigabit mode by default. You can configure all the ports in the extension module to operate in 10-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 speed 10g` command. You can revert to the 25-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 speed 25g` command or the `delete chassis fpc 0 pic-slot 2 port 0 speed 10g` command. All the ports in the extension module can operate in the same mode only.

The 4x10GbE SFP+ extension module operates in 10-gigabit mode by default. You can configure all the ports in the extension module to operate in 1-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 speed 1g` command. You can revert to the 10-gigabit mode by using the `set chassis fpc 0 pic-slot 2 port 0 speed 10g` command or the `delete chassis fpc 0 pic-slot 2 port 0 speed 1g` command. All the ports in the extension module can operate in the same mode only.

Each port on the extension modules has a pair of LEDs that indicate the link activity and status of the port. See "LEDs on the RJ-45, SFP, and SFP+ Network Ports, QSFP28 Ports, and Extension Module Ports on EX4400 Switches" on page 67 for details about the LEDs.

Mounting Options for EX4400 Switches

You can mount the EX4400 switches on a two-post rack, four-post rack, on the desk or a level surface, or on the wall. The EX4400 switch package includes the brackets to install it on a two-post rack, and the rubber feet required to install it on the desk or level surface. Table 6 on page 15 describes the mounting kits available for EX4400 switches.

Table 6: Mounting Kits for EX4400 Switches

Model Number	Description
EX-RMK	Mounting brackets to install the EX4400 switch on a two-post rack or on two posts of a 19-in. four-post rack. This mounting kit is provided as part of the switch package.
EX-4PST-RMK	Adjustable 4-post rack-mount kit to install the EX4400 switch on a 19-in. four-post rack. You have to order this mounting kit separately.
EX-WMK	Wall mount kit to install the EX4400 switch on a wall. You have to order this mounting kit separately.

EX4400 Models and Specifications

SUMMARY

This topic provides details of the EX4400 models and their specifications, information on number of ports and PoE support, throughput, and components in the shipment for each model.

IN THIS SECTION

The EX4400 line of switches consist of both PoE and non-PoE models and multigigabit port models. These switches run on either AC or DC power and support either back-to-front or front-to-back airflow.

Let's take a look at the different EX4400 models and their specifications.

Table 7: EX4400 Switch Models

Non-PoE Models	PoE Models	Multigigabit Models
"EX4400-24T" on page 21	"EX4400-24P" on page 17	"EX4400-24MP" on page 52
"EX4400-24X" on page 28	"EX4400-48P" on page 41	"EX4400-48MP" on page 56
"EX4400-48T" on page 45		
"EX4400-48F" on page 34		

EX4400-24P Switch

Components on the Front and Rear Panels of EX4400-24P Switches

Figure 4 on page 17 shows the front view of an EX4400-24P switch with 24 RJ-45 ports that support PoE-bt.

Figure 4: Front View of an EX4400-24P Switch

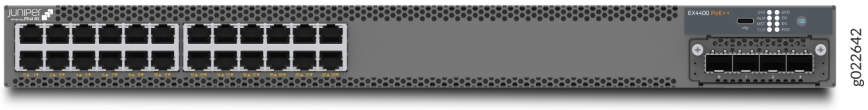


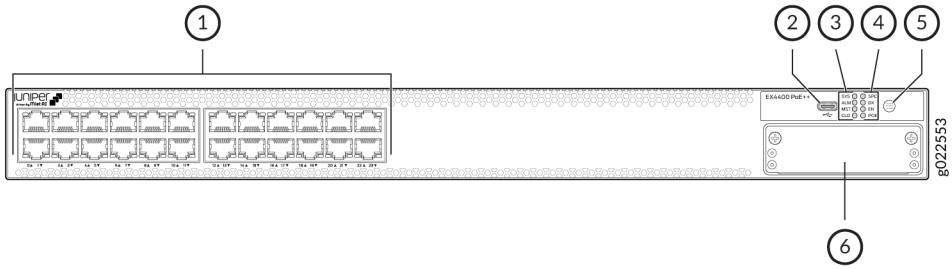
Figure 5 on page 17 shows the rear view of an EX4400-24T and EX4400-24P switch with AC power supplies.

Figure 5: Rear View of an EX4400-24P Switch with AC Power Supplies

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

Figure 6 on page 17 shows the components on the front panel of an EX4400-24P switch.

Figure 6: Components on the Front Panel of an EX4400-24P Switch

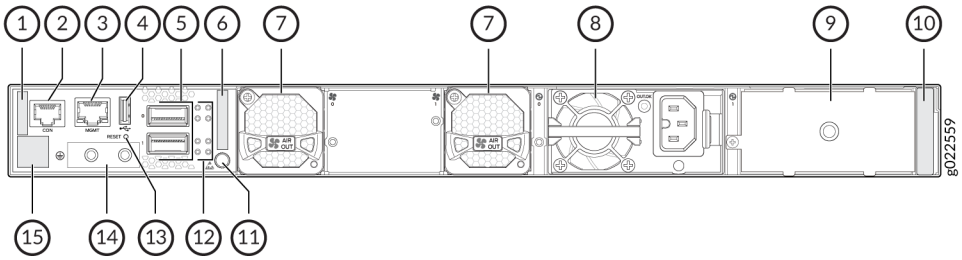


1– 10/100/1000BASE-T ports. These ports support PoE-bt.	4– Port mode LEDs (labeled **SPD**, **DX**, **EN**, and **POE**)
2– USB-C console port	5– Factory reset/mode button
3– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	6– Extension module slot

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

Figure 7 on page 18 shows the components on the rear panel of an EX4400-24P switch. This model supports 1050-W and 1600-W AC power supplies. The EX4400-24P switch supports 1600-W AC power supply if you have Junos OS Release 22.3R1 or later installed. We ship the switch with one 1050-W power supply. You can order the additional power supply separately. You must not install different models of power supplies in the same chassis.

Figure 7: Components on the Rear Panel of an EX4400-24P Switch



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 1050-W AC power supply	

Table 8 on page 19 lists the components shipped with EX4400-24P switch models.

Table 9 on page 19 describes the physical specifications, ports, and throughput of EX4400-24P switches.

Table 10 on page 21 describes the power supply and cooling system specifications of EX4400-24P switch models

Table 8: EX4400-24P Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -24P	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 1050-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -24P-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 9: EX4400-24P Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 9: EX4400-24P Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-24P): 6.9 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24P-S): 5.66 kg • Fan module: 0.26 lb (0.12 kg) • 1050 W AC power supply: 1.98 lb (0.9 kg) • 1600 W AC power supply: 2.0 lb (0.91 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	10/100/1000BASE-T ports: 24 100GbE QSFP28 ports: 2
PoE Ports (PoE-bt)	24—delivers upto 90 W per port
Throughput	324 Gbps—Unidirectional) 648 Gbps—Bbidirectional

Table 10: EX4400-24P Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-24P	Two power supply slots with one power supply preinstalled 1050 W AC (preinstalled) 1600 W AC (optional) Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24P-S	Two power supply slots You need to order AC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) fan modules separately and install them in these slots

EX4400-24T Switches

Components on the Front and Rear Panels of EX4400-24T

Figure 8 on page 21 shows the front view of an EX4400-24T switch with 24 RJ-45 ports.

Figure 8: Front View of an EX4400-24T Switch

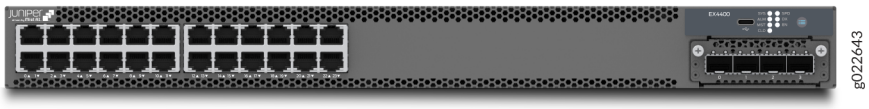


Figure 9 on page 22 shows the rear view of an EX4400-24T switch with AC power supplies.

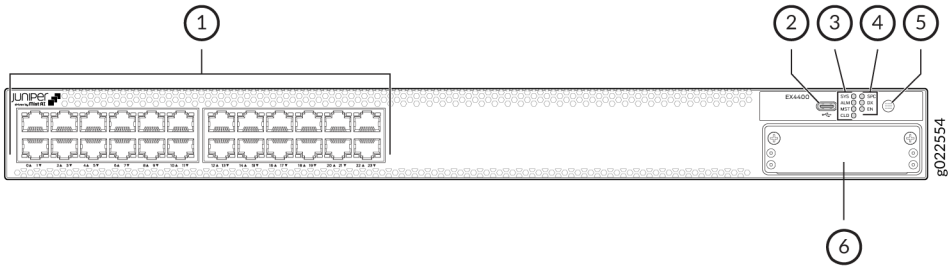
Figure 9: Rear View of an EX4400-24T Switch with AC Power Supplies

Figure 10 on page 22 shows the rear view of an EX4400-24T switch with DC power supplies.

Figure 10: Rear View of an EX4400-24T Switch with DC Power Supplies

Figure 11 on page 22 shows the components on the front panel of an EX4400-24T switch.

Figure 11: Components on the Front Panel of an EX4400-24T Switch



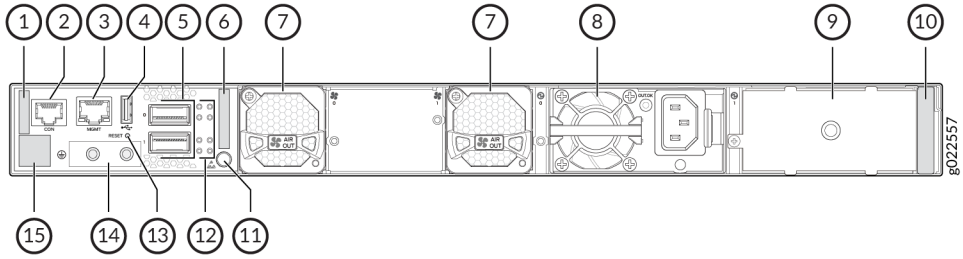
1– 10/100/1000BASE-T ports	4– Port mode LEDs (labeled **SPD**, **DX**, and **EN**)
2– USB-C console port	5– Factory reset/mode button
3– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	6– Extension module slot

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

EX4400-24T model supports 550-W AC or DC power supplies. You must not install AC and DC power supplies in the same chassis.

Figure 12 on page 23 shows the components on the rear panel of an EX4400-24T switch with an AC power supply.

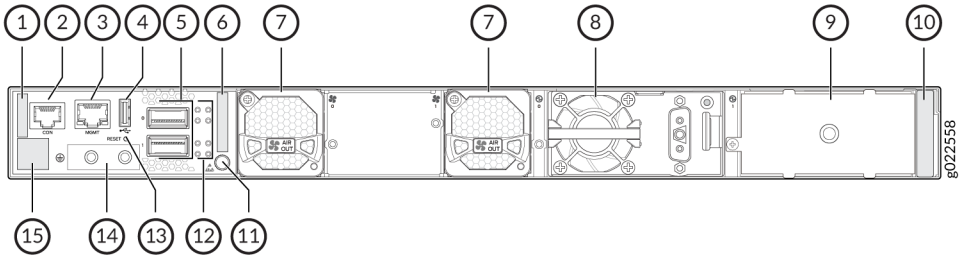
Figure 12: Components on the Rear Panel of an EX4400-24T Switch with an AC Power Supply



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– Electrostatic discharge (ESD) point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– Common Language Equipment Identifier (CLEI) code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 550-W AC power supply	

Figure 13 on page 23 shows the components on the rear panel of an EX4400-24T switch with a DC power supply.

Figure 13: Components on the Rear Panel of an EX4400-24T Switch with a DC Power Supply



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label

8– 550-W DC power supply	

Table 11 on page 24 lists the components shipped with EX4400-24T switch models.

Table 12 on page 25 describes the physical specifications, ports, and throughput of EX4400-24T switches.

Table 13 on page 27 describes the power supply and cooling system specifications of EX4400-24T switch models

Table 11: EX4400-24T Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -24T	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -24T-AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W AC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1
EX4400 -24T-DC	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W DC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -24T-DC -AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W DC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1

Table 11: EX4400-24T Switch Models, Shipped Components, and First Junos Release *(Continued)*

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -24T-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 12: EX4400-24T Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 12: EX4400-24T Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-24T): 6.5 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24T-AFI): 6.5 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24T-DC): 6.45 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24T-DC-AFI): 6.45 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24T-S): 5.36 kg • Fan module: 0.26 lb (0.12 kg) • 550 W AC power supply: 1.76 lb (0.8 kg) • 550 W DC power supply: 1.65 lb (0.75 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	10/100/1000BASE-T ports: 24 100GbE QSFP28 ports: 2
Throughput	324 Gbps—Unidirectional) 648 Gbps—Bbidirectional

Table 13: EX4400-24T Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-24T	Two power supply slots with one power supply preinstalled 550 W AC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24T-AFI	Two power supply slots with one power supply preinstalled 550 W AC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)
EX4400-24T-DC	Two power supply slots with one power supply preinstalled 550 W DC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24T-DC-AFI	Two power supply slots with one power supply preinstalled 550 W DC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)

Table 13: EX4400-24T Switch Models, Power Supplies, Cooling System *(Continued)*

Model	Power Supply Specifications	Cooling System Specifications
EX4400-24T-S	Two power supply slots You need to order AC or DC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) or back-to-front airflow (AFO) fan modules separately and install them in these slots

EX4400-24X Switch

Components on the Front and Rear Panels of EX4400-24X Switches

Figure 14 on page 28 shows the front view of an EX4400-24X switch with 24 10GbE small form-factor pluggable (SFP)/small form-factor pluggable plus (SFP+) ports.

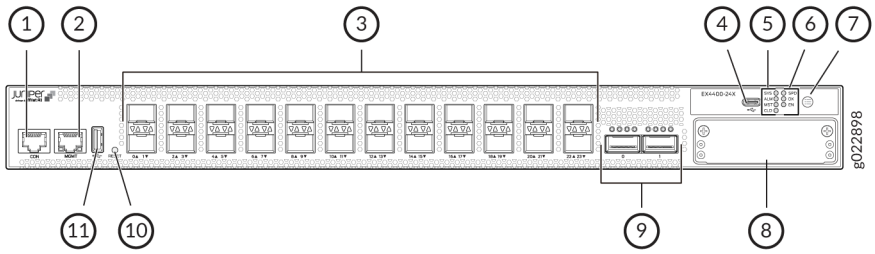
Figure 14: Front View of an EX4400-24X Switch

Figure 15 on page 28 shows the rear view of an EX4400-24X switch with an AC power supply.

Figure 15: Rear View of an EX4400-24X Switch with an AC Power Supply

Figure 16 on page 29 shows the components on the front panel of an EX4400-24X switch.

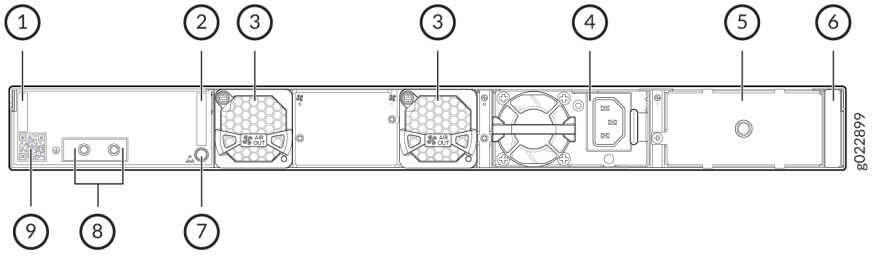
Figure 16: Components on the Front Panel of an EX4400-24X Switch



1– Console port (labeled **CON**)	7– Factory reset/mode button
2– Management port (labeled **MGMT**)	8– Extension module slot
3– 24 SFP/SFP+ ports	9– QSFP28 ports
4– USB-C console port	10– Reset button
5– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	11– USB-A port
6– Port mode LEDs (labeled **SPD**, **DX**, and **EN**)	

Figure 17 on page 29 shows the components on the rear panel of an EX4400-24X switch with an AC power supply.

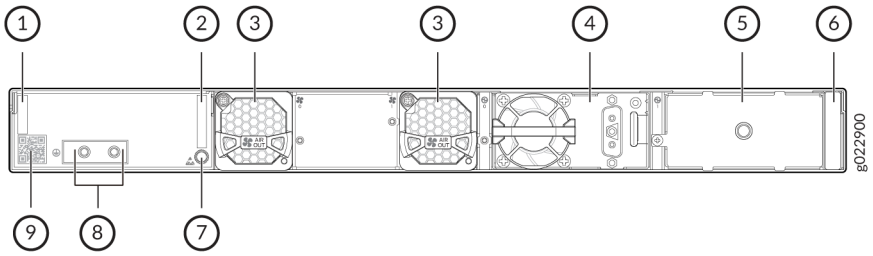
Figure 17: Components on the Rear Panel of an EX4400-24X Switch with an AC Power Supply



1– Serial number ID label	6– Power supply rating label
2– CLEI code label	7– ESD point
3– Fan module	8– Protective earthing terminal
4– 550-W AC power supply	9– Claim code label
5– Empty slot for power supply	

Figure 18 on page 30 shows the components on the rear panel of an EX4400-24X switch with a DC power supply.

Figure 18: Components on the Rear Panel of an EX4400-24X Switch with a DC Power Supply



1– Serial number ID label	6– Power supply rating label
2– CLEI code label	7– ESD point
3– Fan module	8– Protective earthing terminal
4– 550-W DC power supply	9– Claim code label
5– Empty slot for power supply	

Table 14 on page 30 lists the components shipped with EX4400-24X switch models.

Table 15 on page 31 describes the physical specifications, ports, and throughput of EX4400-24X switches.

Table 16 on page 33 describes the power supply and cooling system specifications of EX4400-24X switch models

Table 14: EX4400-24X Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -24X	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400-24X-AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W AC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	23.1R1

Table 14: EX4400-24X Switch Models, Shipped Components, and First Junos Release *(Continued)*

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400-24X-DC	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W DC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	23.1R1
EX4400 -24X-DC-AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W DC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	23.1R1

Table 15: EX4400-24X Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 15: EX4400-24X Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-24X): 6.7 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24X-S): 5.52 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24X-AFI): 6.7 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24X-DC): 6.65 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24X-DC-AFI): 6.65 kg • Fan module: 0.26 lb (0.12 kg) • 550 W AC power supply: 1.76 lb (0.8 kg) • 550 W DC power supply: 1.65 lb (0.75 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	1/10GbE ports: 24 100GbE QSFP28 ports: 2
Throughput	540 Gbps—Unidirectional) 1080 Gbps—Bbidirectional

Table 16: EX4400-24X Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-24X	Two power supply slots with one power supply preinstalled 550 W AC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24X-AFI	Two power supply slots with one power supply preinstalled 550 W AC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)
EX4400-24X-DC	Two power supply slots with one power supply preinstalled 550 W DC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24X-DC-AFI	Two power supply slots with one power supply preinstalled 550 W DC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)

EX4400-48F Switches

Components on the Front and Rear Panels of EX4400-48F Switches

Figure 19 on page 34 shows the front view of an EX4400-48F switch with 36 SFP ports and 12 SFP+ ports.

Figure 19: Front View of an EX4400-48F Switch

Figure 20 on page 34 shows the rear view of an EX4400-48F switch with AC power supplies.

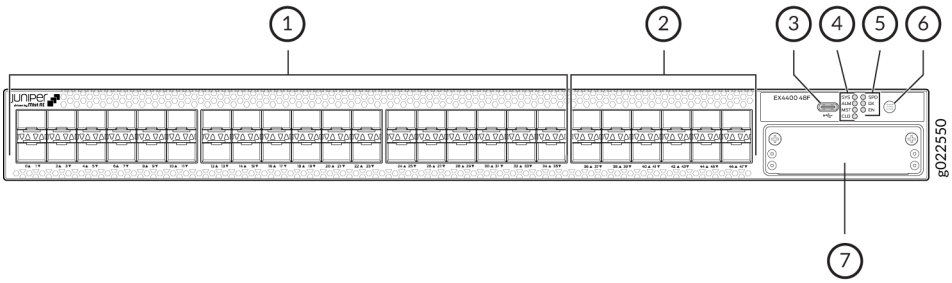
Figure 20: Rear View of an EX4400-48F Switch with AC Power Supplies

Figure 21 on page 34 shows the rear view of an EX4400-48F switch with DC power supplies.

Figure 21: Rear View of an EX4400-48F Switch with DC Power Supplies

Figure 22 on page 35 shows the components on the front panel of an EX4400-48F switch.

Figure 22: Components on the Front Panel of an EX4400-48F Switch



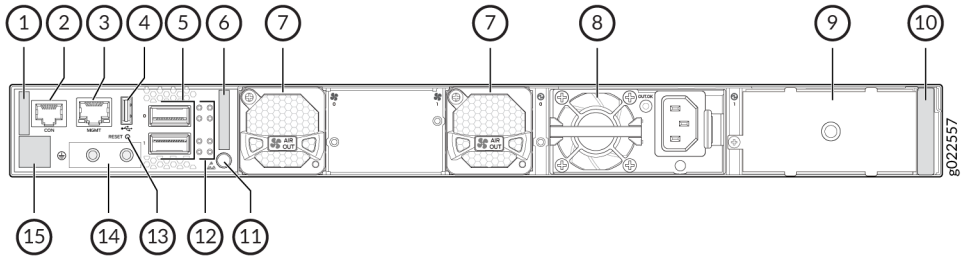
1– SFP ports	5– Port mode LEDs (labeled **SPD**, **DX**, and **EN**)
2– SFP+ ports	6– Factory reset/mode button
3– USB-C console port	7– Extension module slot
4– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

EX4400-48F model supports 550-W AC or DC power supplies. You must not install AC and DC power supplies in the same chassis.

Figure 23 on page 35 shows the components on the rear panel of an EX4400-48F switch with an AC power supply.

Figure 23: Components on the Rear Panel of an EX4400-48F Switch with an AC Power Supply

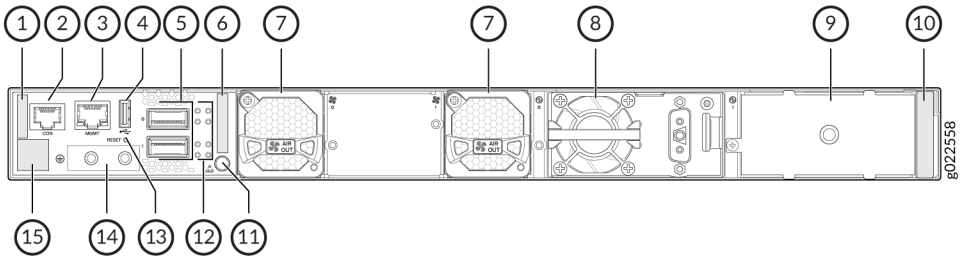


1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button

6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 550-W AC power supply	

Figure 24 on page 36 shows the components on the rear panel of an EX4400-48F switch with a DC power supply.

Figure 24: Components on the Rear Panel of an EX4400-48F Switch with a DC Power Supply



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 550-W DC power supply	

Table 17 on page 37 lists the components shipped with EX4400-48F switch models.

Table 18 on page 37 describes the physical specifications, ports, and throughput of EX4400-48F switches.

Table 19 on page 40 describes the power supply and cooling system specifications of EX4400-48F switch models

Table 17: EX4400-48F Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400-48T	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48T-AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W AC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1
EX4400 -48T-DC	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W DC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48T-DC -AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W DC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1
EX4400 -48T-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 18: EX4400-48F Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)

Table 18: EX4400-48F Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description	
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 18: EX4400-48F Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-48F): 6.65 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48F-DC): 6.89 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48F-S): 5.8 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48F-AFI): 6.94 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48F-DC-AFI): 6.89 kg • Fan module: 0.26 lb (0.12 kg) • 550 W AC power supply: 1.76 lb (0.8 kg) • 550 W DC power supply: 1.65 lb (0.75 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	100/1000BASE-X ports: 36 1000/10000BASE-X: 12
Throughput	348 Gbps—Unidirectional) 696 Gbps—Bbidirectional

Table 19: EX4400-48F Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48F	Two power supply slots with one power supply preinstalled 550 W AC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48F-AFI	Two power supply slots with one power supply preinstalled 550 W AC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)
EX4400-48F-DC	Two power supply slots with one power supply preinstalled 550 W DC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48F-DC-AFI	Two power supply slots with one power supply preinstalled 550 W DC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)

Table 19: EX4400-48F Switch Models, Power Supplies, Cooling System *(Continued)*

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48F-S	Two power supply slots You need to order AC or DC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) or back-to-front airflow (AFO) fan modules separately and install them in these slots

EX4400-48P Switch

Components on the Front and Rear Panels of an EX4400-48P Switch

Figure 25 on page 41 shows the front view of an EX4400-48P switch with 48 RJ-45 ports that support PoE-bt.

Figure 25: Front View of an EX4400-48P Switch

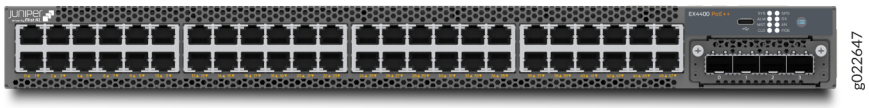


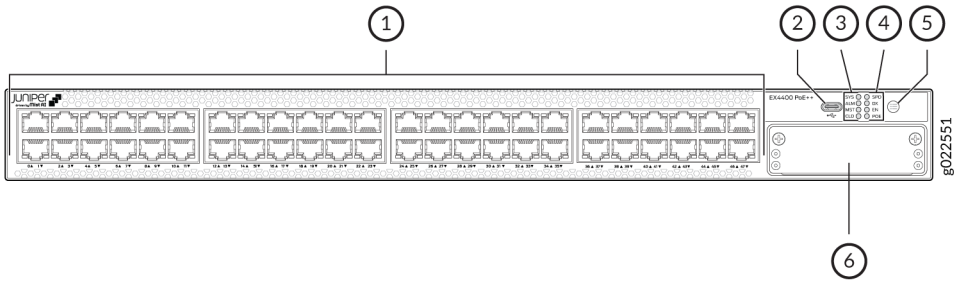
Figure 26 on page 41 shows the rear view of an EX4400-48P switch.

Figure 26: Rear View of an EX4400-48P Switch

NOTE: We've enabled the **CLD** LED feature in Junos OS Release 21.2R1.

Figure 27 on page 42 shows the components on the front panel of an EX4400-48P switch.

Figure 27: Components on the Front Panel of an EX4400-48P Switch

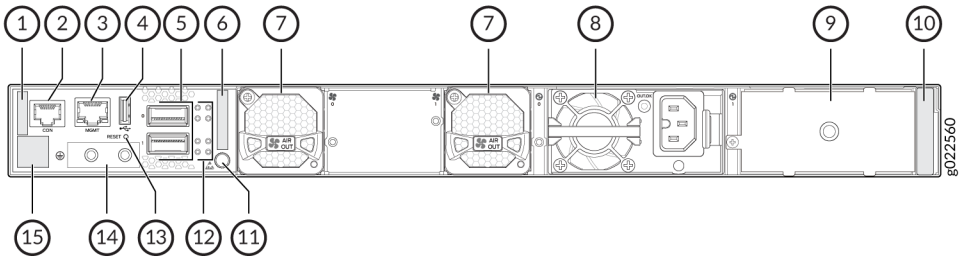


1– 10/100/1000BASE-T ports. These ports support PoE-bt.	4– Port mode LEDs (labeled **SPD**, **DX**, **EN**, and **POE**)
2– USB-C console port	5– Factory reset/mode button
3– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	6– Extension module slot

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

Figure 28 on page 42 shows the components on the rear panel of an EX4400-48P switch. This model supports only 1600-W AC power supply.

Figure 28: Components on the Rear Panel of an EX4400-48P Switch



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label

8– 1600-W AC power supply	

Table 20 on page 43 lists the components shipped with EX4400-48P switch models.

Table 21 on page 43 describes the physical specifications, ports, and throughput of EX4400-48P switches.

Table 22 on page 45 describes the power supply and cooling system specifications of EX4400-48P switch models

Table 20: EX4400-48P Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -48P	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 1600-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48P-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 21: EX4400-48P Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).

Table 21: EX4400-48P Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description	
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-48P): 7.22 kg) • Switch with no power supply, fan module, or extension module installed (EX4400-48P-S): 5.88 kg) • Fan module: 0.26 lb (0.12 kg) • 1600 W AC power supply: 2.0 lb (0.91 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.	
Built-in ports	10-Mbps/100-Mbps/1000-Mbps PoE ports: 48 100GbE QSFP28 ports: 2	
PoE Ports (PoE-bt)	48—delivers upto 90 W per port	
Throughput	324 Gbps—Unidirectional) 648 Gbps—Bbidirectional	

Table 22: EX4400-48P Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48P	Two power supply slots with one power supply preinstalled 1600 W AC (optional) Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48P-S	Two power supply slots You need to order AC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) fan modules separately and install them in these slots

EX4400-48T Switches

Components on the Front and Rear Panels of EX4400-48T and EX4400-48P Switches

Figure 29 on page 45 shows the front view of an EX4400-48T switch with 48 RJ-45 ports.

Figure 29: Front View of an EX4400-48T Switch

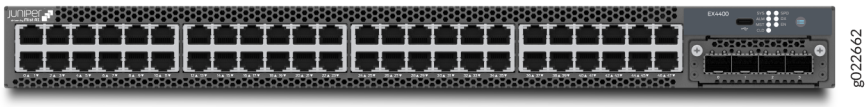


Figure 30 on page 46 shows the rear view of an EX4400-48T switch with AC power supplies.

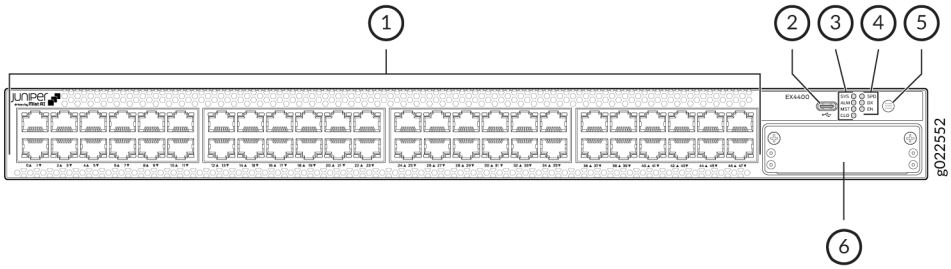
Figure 30: Rear View of an EX4400-48T Switch with AC Power Supplies

Figure 31 on page 46 shows the rear view of an EX4400-48T switch with DC power supplies.

Figure 31: Rear View of an EX4400-48T Switch with DC Power Supplies

Figure 32 on page 46 shows the components on the front panel of an EX4400-48T switch.

Figure 32: Components on the Front Panel of an EX4400-48T Switch



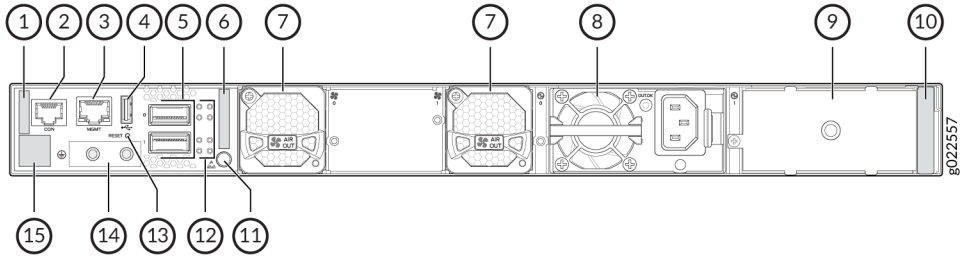
1– 10/100/1000BASE-T ports	4– Port mode LEDs (labeled **SPD**, **DX**, and **EN**)
2– USB-C console port	5– Factory reset/mode button
3– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	6– Extension module slot

NOTE: We enabled the **CLD** LED feature in Junos OS Release 21.2R1.

EX4400-48T model supports 550-W AC or DC power supplies. You must not install AC and DC power supplies in the same chassis.

Figure 33 on page 47 shows the components on the rear panel of an EX4400-48T switch with an AC power supply.

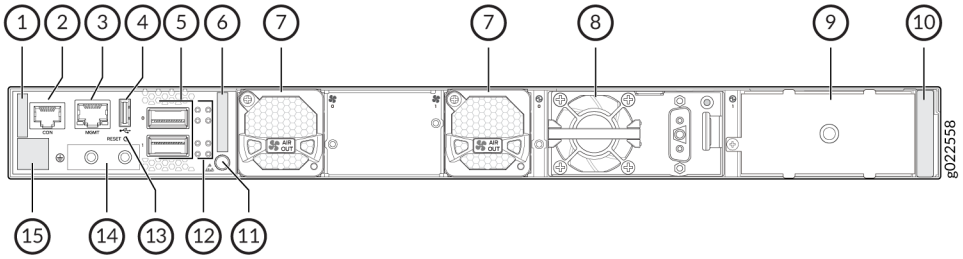
Figure 33: Components on the Rear Panel of an EX4400-48T Switch with an AC Power Supply



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 550-W AC power supply	

Figure 34 on page 47 shows the components on the rear panel of an EX4400-48T switch with a DC power supply.

Figure 34: Components on the Rear Panel of an EX4400-48T Switch with a DC Power Supply



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 550-W DC power supply	

Table 23 on page 48 lists the components shipped with EX4400-48T switch models.

Table 24 on page 49 describes the physical specifications, ports, and throughput of EX4400-48T switches.

Table 25 on page 51 describes the power supply and cooling system specifications of EX4400-48T switch models

Table 23: EX4400-48T Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -48T	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48T-AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W AC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1
EX4400 -48T-DC	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 550-W DC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48T-DC -AFI	Two fan modules with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	A 550-W DC power supply with back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	21.1R1
EX4400 -48T-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 24: EX4400-48T Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 24: EX4400-48T Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-48T): 6.71 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48T-AFI): 6.71 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48T-DC): 6.66 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48T-DC-AFI): 6.66 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48T-S): 5.58 kg • Fan module: 0.26 lb (0.12 kg) • 550 W AC power supply: 1.76 lb (0.8 kg) • 550 W DC power supply: 1.65 lb (0.75 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	10/100/1000BASE-T ports: 48 100GbE QSFP28 ports: 2
Throughput	348 Gbps—Unidirectional) 696 Gbps—Bbidirectional

Table 25: EX4400-48T Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48T	Two power supply slots with one power supply preinstalled 550 W AC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48T-AFI	Two power supply slots with one power supply preinstalled 550 W AC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)
EX4400-48T-DC	Two power supply slots with one power supply preinstalled 550 W DC Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48T-DC-AFI	Two power supply slots with one power supply preinstalled 550 W DC Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)	Two fan module slots with fan modules preinstalled Back-to-front airflow (indicated by the **AIR IN** label and the Juniper Azure Blue handle)

Table 25: EX4400-48T Switch Models, Power Supplies, Cooling System *(Continued)*

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48T-S	Two power supply slots You need to order AC or DC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) or back-to-front airflow (AFO) fan modules separately and install them in these slots

EX4400-24MP Switch

Components on the Front and Rear Panels of EX4400-24MP Switches

Figure 35 on page 52 shows the front view of an EX4400-24MP switch with 24 RJ-45 ports that support PoE-bt.

Figure 35: Front View of an EX4400-24MP Switch

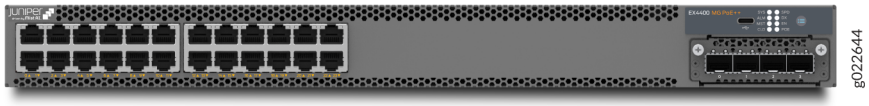
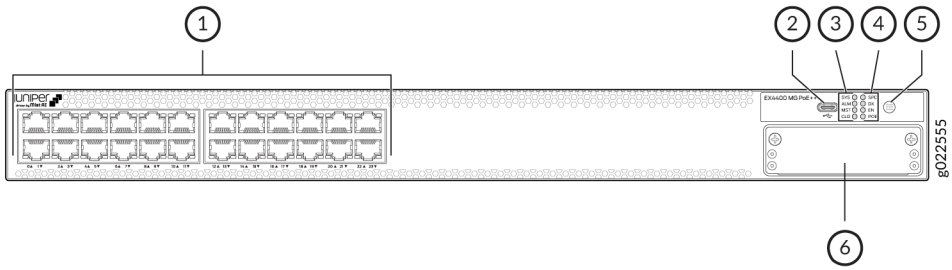


Figure 36 on page 52 shows the rear view of an EX4400-24MP switch.

Figure 36: Rear View of an EX4400-24MP Switch

Figure 37 on page 53 shows the components on the front panel of an EX4400-24MP switch.

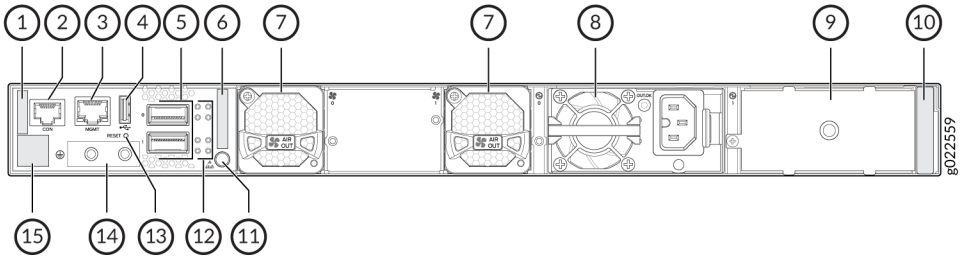
Figure 37: Components on the Front Panel of an EX4400-24MP Switch



1– 100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10-Gbps RJ-45 ports. These ports support PoE-bt.	4– Port mode LEDs (labeled **SPD**, **DX**, **EN**, and **POE**)
2– USB-C console port	5– Factory reset/mode button
3– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	6– Extension module slot

Figure 38 on page 53 shows the components on the rear panel of an EX4400-24MP switch. This model supports 1600-W AC power supply if you have Junos OS Release 22.3R1 or later installed. We ship the switch with one 1050-W power supply. You can order the additional power supply separately. You must not install different models of power supplies in the same chassis.

Figure 38: Components on the Rear Panel of an EX4400-24MP Switch



1– Serial number ID label	9– Empty slot for power supply
2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 1050-W AC power supply	

Table 26 on page 54 lists the components shipped with EX4400-24MP switch models.

Table 27 on page 54 describes the physical specifications, ports, and throughput of EX4400-24MP switches.

Table 28 on page 56 describes the power supply and cooling system specifications of EX4400-24MP switch models

Table 26: EX4400-24MP Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400-24MP	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 1050-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400-24MP-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 27: EX4400-24MP Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed

Table 27: EX4400-24MP Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-24MP): 7.07 kg • Switch with no power supply, fan module, or extension module installed (EX4400-24MP-S): 6.06 kg • Fan module: 0.26 lb (0.12 kg) • 1050 W AC power supply: 1.98 lb (0.9 kg) • 1600 W AC power supply: 2.0 lb (0.91 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.
Built-in ports	100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10-Gbps ports: 24
PoE Ports (PoE-bt)	24—delivers upto 90 W per port
Throughput	540 Gbps—Unidirectional) 1080 Gbps—Bbidirectional

Table 28: EX4400-24MP Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-24MP	Two power supply slots with one power supply preinstalled 1050 W AC (preinstalled) 1600 W AC (optional) Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-24MP-S	Two power supply slots You need to order AC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) fan modules separately and install them in these slots

EX4400-48MP Switch

Components on the Front and Rear Panels of EX4400-48MP Switches

Figure 39 on page 56 shows the front view of an EX4400-48MP switch with 48 RJ-45 ports that support PoE-bt.

Figure 39: Front View of an EX4400-48MP Switch

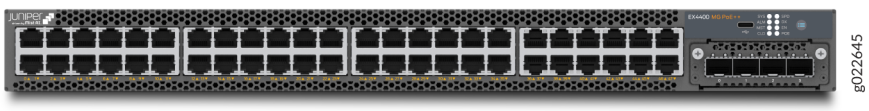


Figure 40 on page 57 shows the rear view of an EX4400-48MP switch.

Figure 40: Rear View of an EX4400-48MP Switch

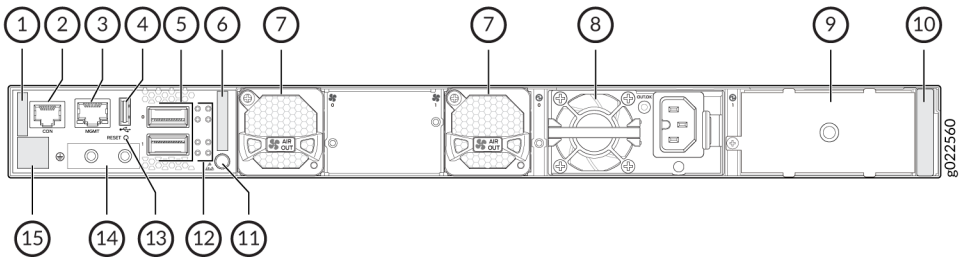
Figure 41 on page 57 shows the components on the front panel of an EX4400-48MP switch.

Figure 41: Components on the Front Panel of an EX4400-48MP Switch

1– 100-Mbps/1-Gbps/2.5-Gbps RJ-45 ports. These ports support PoE-bt.	5– Port mode LEDs (labeled **SPD**, **DX**, **EN**, and **POE**)
2– 100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10-Gbps RJ-45 ports. These ports support PoE-bt.	6– Factory reset/mode button
3– USB-C console port	7– Extension module slot
4– Chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**)	

Figure 42 on page 57 shows the components on the rear panel of an EX4400-48MP switch. This model supports only 1600-W AC power supply.

Figure 42: Components on the Rear Panel of an EX4400-48MP Switch



1– Serial number ID label	9– Empty slot for power supply

2– Console port (labeled **CON**)	10– Power supply rating label
3– Management port (labeled **MGMT**)	11– ESD point
4– USB-A port	12– QSFP28 port LEDs
5– QSFP28 ports	13– Reset button
6– CLEI code label	14– Protective earthing terminal
7– Fan module	15– Claim code label
8– 1600-W AC power supply	

Table 29 on page 58 lists the components shipped with EX4400-48MP switch models.

Table 30 on page 58 describes the physical specifications, ports, and throughput of EX4400-48MP switches.

Table 31 on page 60 describes the power supply and cooling system specifications of EX4400-48MP switch models

Table 29: EX4400-48MP Switch Models, Shipped Components, and First Junos Release

Model Number	Fan Modules	Power Supply	First Junos OS Release
EX4400 -48MP	Two fan modules with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	A 1600-W AC power supply with front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	21.1R1
EX4400 -48MP-S	We don't ship fan modules for this model by default; you must order two fan modules separately.	We don't ship power supplies for this model by default; you must order them separately.	21.1R1

Table 30: EX4400-48MP Switches—Physical Specifications, Ports, Throughput

Item	Description	
Chassis Dimensions	Height	1.72 in. (4.37 cm)

Table 30: EX4400-48MP Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description	
	Width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
	Depth	15.71 in. (39.9 cm)—With no power supply, fan module, or extension module installed 16.93 in. (43 cm)—With power supply and fan module installed 17.35 in. (44.07 cm)—With power supply, fan module, and extension module installed
Weight	• Switch with no power supply, fan module, or extension module installed (EX4400-48MP): 7.35 kg • Switch with no power supply, fan module, or extension module installed (EX4400-48MP-S): 6.34 kg • Fan module: 0.26 lb (0.12 kg) • 1600 W AC power supply: 2.0 lb (0.91 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.	
Built-in ports	100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10-Gbps PoE ports: 12 100-Mbps/1-Gbps/2.5-Gbps PoE ports: 36	

Table 30: EX4400-48MP Switches—Physical Specifications, Ports, Throughput *(Continued)*

Item	Description
PoE Ports (PoE-bt)	48—delivers upto 90 W per port
Throughput	510 Gbps—Unidirectional) 1020 Gbps—Bidirectional

Table 31: EX4400-48MP Switch Models, Power Supplies, Cooling System

Model	Power Supply Specifications	Cooling System Specifications
EX4400-48MP	Two power supply slots with one power supply preinstalled 1600 W AC (optional) Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)	Two fan module slots with fan modules preinstalled Front-to-back airflow (indicated by the **AIR OUT** label and the Juniper Gold handle)
EX4400-48MP-S	Two power supply slots You need to order AC power supplies separately and install them in these slots	Two fan module slots You need to order front-to-back airflow (AFI) fan modules separately and install them in these slots

EX4400 Chassis

IN THIS SECTION

Chassis Physical Specifications for EX4400 Switches

The EX4400 switch chassis is a rigid sheet-metal structure that houses all components of the switch. Table 32 on page 61 summarizes the physical specifications of the EX4400 switch chassis.

Figure 43: EX4400 Switches—Dimensions and Clearance Requirements

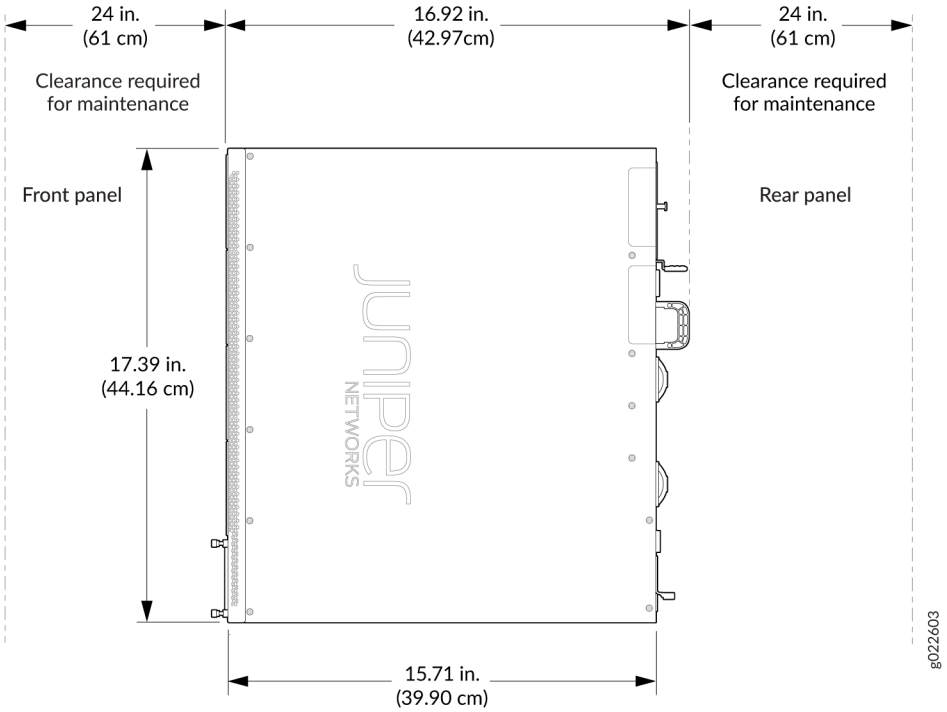


Table 32: Physical Specifications of the EX4400 Switch Chassis

Description	Value
Chassis height	1.72 in. (4.37 cm)

Table 32: Physical Specifications of the EX4400 Switch Chassis *(Continued)*

Description	Value
Chassis width	17.39 in. (44.17 cm) The outer edges of the front-mounting brackets extend the width to 19 in. (48.2 cm).
Chassis depth	• With no power supply, fan module, or extension module installed: 15.71 in. (39.9 cm) • With power supply and fan module installed: 16.93 in. (43 cm) The cables and power supply cords you connect to the switch extend the depth. • With power supply, fan module, and extension module installed: 17.35 in. (44.07 cm)
Weight	• Switch with no power supply, fan module, or extension module installed: 12–13.67 lb (5.43–6.2 kg) • Fan module: 0.26 lb (0.12 kg) • 550 W AC power supply: 1.76 lb (0.8 kg) • 550 W DC power supply: 1.65 lb (0.75 kg) • 1050 W AC power supply: 1.98 lb (0.9 kg) • 1600 W AC power supply: 2 lb (0.91 kg) • 1x100GbE QSFP28 extension module (model number: EX4400-EM-1C): 0.26 lb (0.12 kg) • 4x10GbE SFP+ extension module (model number: EX4400-EM-4S): 0.2 lb (0.09 kg) • 4x25GbE SFP28 extension module (model number: EX4400-EM-4Y): 0.29 lb (0.13 kg) We ship the switch preinstalled with one power supply, two fan modules, one cover for the empty extension module slot, and one cover for the empty power supply slot.

You can mount an EX4400 switch:

- On a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting brackets provided with the switch.
- Flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit.
- In a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit.
- On a desk or other level surface by using the rubber feet provided with the switch.
- On a wall by using a separately orderable wall mount kit.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

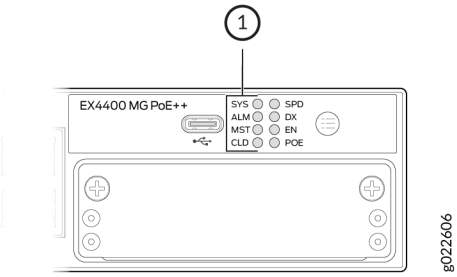
See "EX4400 Models and Specifications" on page 16 to know more about the EX4400 models and their specifications.

Chassis Status LEDs on EX4400 Switches

Each EX4400 switch has four chassis status LEDs (labeled **SYS**, **ALM**, **MST**, and **CLD**) on the right-hand side of the front panel (see Figure 44 on page 63).

For information on the blink patterns of the CLD LED, which provide the cloud connection status of the switch, see Cloud Ready LED Blink Patterns, or see Cloud Connection Process, to understand how the cloud connection works.

Figure 44: Chassis Status LEDs in EX4400 Switches



1– Chassis status LEDs

Table 33 on page 64 describes the chassis status LEDs labeled **SYS**, **ALM**, and **MST** on an EX4400 switch, their colors and states, and the status they indicate. You can view the colors of the LEDs remotely through the CLI by issuing the `show chassis led` operational mode command. All LEDs can be lit simultaneously.

Table 33: SYS, ALM, and MST Chassis Status LEDs on EX4400 Switches

LED Label	Color	State and Description
SYS	Green	• On steadily—Junos OS for EX Series switches is loaded on the switch. • Blinking—The switch is booting.
	Unlit	The switch is powered off or is halted.
ALM	Red	There is a major hardware fault, such as a temperature alarm or a power failure alarm, and the switch is halted. A major alarm indicates a critical error condition that requires immediate attention (see "Chassis Component Alarm Conditions on EX4400 Switches" on page 242).
	Amber	There is a minor alarm, such as a software or a hardware error. Power off the switch and then power it on. Monitor the switch to see whether it is working properly. A minor alarm indicates a noncritical condition that requires monitoring or maintenance. A minor alarm that is left unchecked might cause interruption in service or performance degradation.
	Unlit	There is no alarm or the switch is halted.
MST	Green	In a standalone switch: • On steadily—The switch is functioning normally. • Off—The switch is powered off or is halted.

Table 33: SYS, ALM, and MST Chassis Status LEDs on EX4400 Switches *(Continued)*

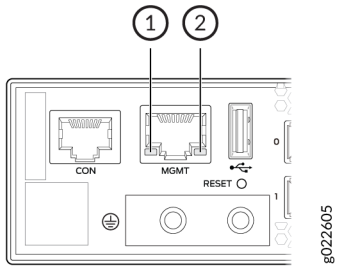
LED Label	Color	State and Description
		In a Virtual Chassis configuration: • On steadily—The switch is the primary switch in the Virtual Chassis configuration. • Blinking—The switch is functioning as the backup switch in the Virtual Chassis configuration. • Off—The switch is a linecard member in the Virtual Chassis configuration or the switch is halted.

NOTE: Issuing `request system power-off` doesn't power-off the **SYS** LED, which continues to blink. It is because this command will power-off only the CPU board. As CPU board asserts platform reset during shutdown process, it will trigger **SYS** LED to enter default state of blinking. This is expected behavior.

LEDs on the Management Port on EX4400 Switches

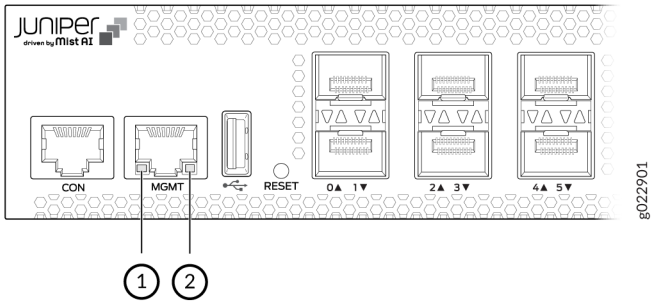
The management port—labeled **MGMT**—has two LEDs that indicate link activity and status of the port (see Figure 45 on page 65 and Figure 46 on page 66). The management port is on the rear panel of EX4400 switch models except the EX4400-24X model. The management port is on the front panel of the EX4400-24X model.

Figure 45: LEDs on the Management Port on EX4400 Switches Except the EX4400-24X Model



1– Link activity LED	2– Status LED

Figure 46: LEDs on the Management Port on the EX4400-24X Model



1– Link activity LED	2– Status LED

Table 34 on page 66 describes the LEDs.

Table 34: LEDs on the Management Port on EX4400 Switches

LED	State and Description
Link activity	• On steadily—The port and the link are active, but there is no link activity. • Blinking—The port and the link are active, and there is link activity. • Off—The port is not active.
Status	Indicates the speed: • On steadily—Link speed is 1000 Mbps. • Blinking—Link speed is 100 Mbps. • Off—Link speed is 10 Mbps.

LEDs on the RJ-45, SFP, and SFP+ Network Ports, QSFP28 Ports, and Extension Module Ports on EX4400 Switches

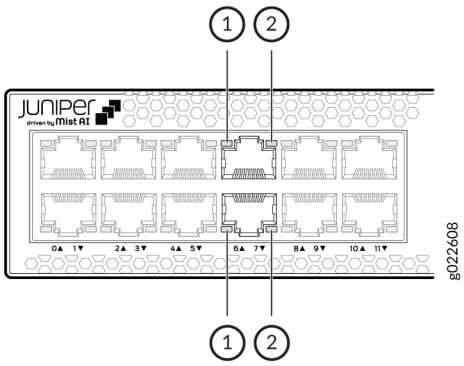
IN THIS SECTION

The RJ-45, small form-factor pluggable (SFP), and small form-factor pluggable plus (SFP+) network ports, SFP+, SFP28, and QSFP28 extension module ports, and QSFP28 ports on EX4400 switches have LEDs that show the link activity and status of the port.

LEDs on the Network Ports

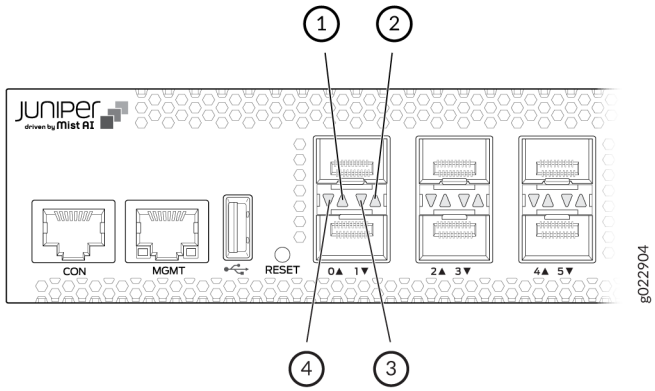
Figure 47 on page 67 shows the LEDs on the RJ-45 network ports on EX4400-24T, EX4400-24P, EX4400-24MP, EX4400-48T, EX4400-48P, and EX4400-48MP switches. Figure 48 on page 68 shows the LEDs on the SFP+ network ports on EX4400-24X switches. Figure 49 on page 68 shows the LEDs on the SFP network ports on EX4400-48F switches. Figure 50 on page 69 shows the LEDs on the SFP + network ports on EX4400-48F switches.

Figure 47: LEDs on the RJ-45 Network Ports on EX4400-24T, EX4400-24P, EX4400-24MP, EX4400-48T, EX4400-48P, and EX4400-48MP Switches



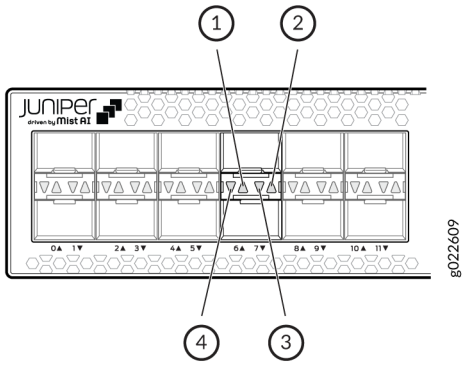
1– Link activity LED	2– Status LED

Figure 48: LEDs on the SFP+ Network Ports on EX4400-24X Switches



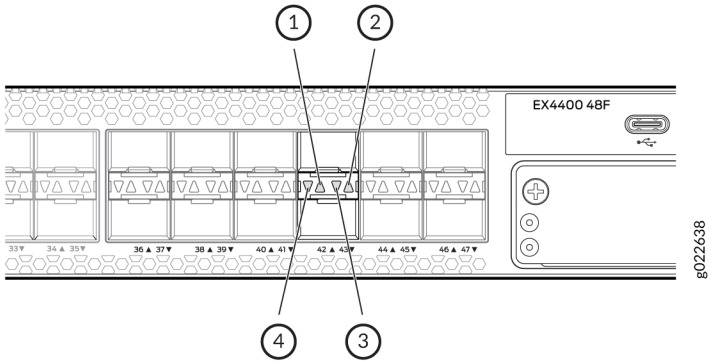
1– Link activity LED for the upper port	3– Status LED for the lower port
2– Status LED for the upper port	4– Link activity LED for the lower port

Figure 49: LEDs on the SFP Network Ports on EX4400-48F Switches



1– Link activity LED for the upper port	3– Status LED for the lower port
2– Status LED for the upper port	4– Link activity LED for the lower port

Figure 50: LEDs on the SFP+ Network Ports on EX4400-48F Switches



1– Link activity LED for the upper port	3– Status LED for the lower port
2– Status LED for the upper port	4– Link activity LED for the lower port

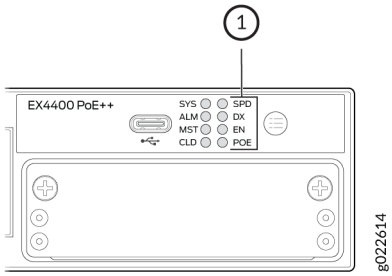
Table 35 on page 69 describes the link activity LED on the network ports.

Table 35: Link Activity LED on the Network Ports

Color	State and Description
Green	• On steadily—The port and the link are active, but there is no link activity. • Blinking—The port and the link are active, and there is link activity. • Off—The port is not active.

EX4400 switches have network port mode LEDs labeled **SPD**, **DX**, and **EN** on the right-hand side of the front panel; models with ports that support PoE-bt have an additional mode LED labeled **POE** (see Figure 51 on page 70). These LEDs indicate the status of the network ports. Use the mode button on the right-hand side of the front panel to toggle the status LEDs to show the different port parameters for the network ports; the port parameter is indicated by the LED that is lit. Table 36 on page 70 describes the status LEDs.

Figure 51: Port Mode LEDs on EX4400 Switches



1– Port Mode LEDs

Table 36: Status LEDs on the RJ-45, SFP, and SFP+ Network Ports

LED	Color	State and Description

SPD	Green	Indicates the speed at which the RJ-45, SFP, and SFP+ network ports operate.
		• The speed indicators for EX4400-24T, EX4400-24P, EX4400-24MP, EX4400-48T, EX4400-48P, and EX4400-48MP models are:
		  • On steadily—1000 Mbps
		  • Blinking—100 Mbps
		  • Unlit—10 Mbps
		• The speed indicators for the SFP ports on the EX4400-48F model are:
		  • On steadily—1000 Mbps
		  • Blinking—100 Mbps
		• The speed indicators for the SFP+ ports on EX4400-24X and EX4400-48F models are:
		  • On steadily—10 Gbps
		  • Blinking—1000 Mbps

Table 36: Status LEDs on the RJ-45, SFP, and SFP+ Network Ports *(Continued)*

LED	Color	State and Description
	Amber	The speed indicators for EX4400-24MP and EX4400-48MP are: • On steadily—2.5 Gbps • Blinking—5 Gbps
	Blue	The speed indicator for EX4400-24MP and EX4400-48MP is: • On steadily—10 Gbps
DX	Green	Indicates the duplex mode. The status indicators are: • On steadily—The port is set to full-duplex mode. • Unlit—The port is set to half-duplex mode.
EN	Green	Indicates the administrative status. The status indicators are: • On steadily—The port is administratively enabled. • Unlit—The port is administratively disabled.
POE	Green	Indicates the PoE-bt mode for ports that support PoE-bt. The status indicators are: • On steadily—PoE-bt is enabled on the port, and a device is drawing power. • Blinking—PoE-bt is enabled on the port, but no power is drawn from the port. • Unlit—PoE-bt is not enabled on the port.

Table 37 on page 72 describes the beacon functionality on the status LEDs on the RJ-45, SFP, and SFP + network ports when you execute the `request chassis beacon` command.

Table 37: Beacon Functionality on the Status LEDs on the RJ-45, SFP, and SFP+ Network Ports

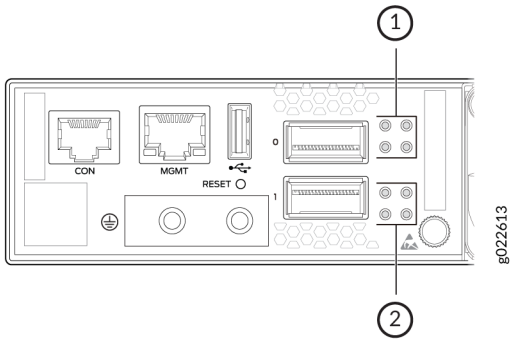
LED	Color	State	Description
Status LEDs on all the ports	Green	Blinking, irrespective of the mode the ports are operating in.	Helps identify the switch.
Status LED on the applicable port			Helps identify the port.

LEDs on the QSFP28 Ports

Figure 52 on page 72 and Figure 53 on page 73 show the LEDs for the QSFP28 ports on EX4400 switch models except the EX4400-24X model. The top left LEDs are lit green when the ports operate as Virtual Chassis ports (VCPs).

Figure 54 on page 73 and Figure 55 on page 74 show the LEDs for the QSFP28 ports on the EX4400-24X model. The LEDs on the extreme left hand side are lit green when the ports operate as VCPs. Table 38 on page 74 describes the LED when the ports are configured as network ports.

Figure 52: LEDs for the QSFP28 Ports on EX4400 Switch Models Except the EX4400-24X Model



1– LEDs for the upper port	2– LEDs for the lower port

Figure 53: Link Activity LEDs for the QSFP28 Ports on EX4400 Switch Models Except the EX4400-24X Model

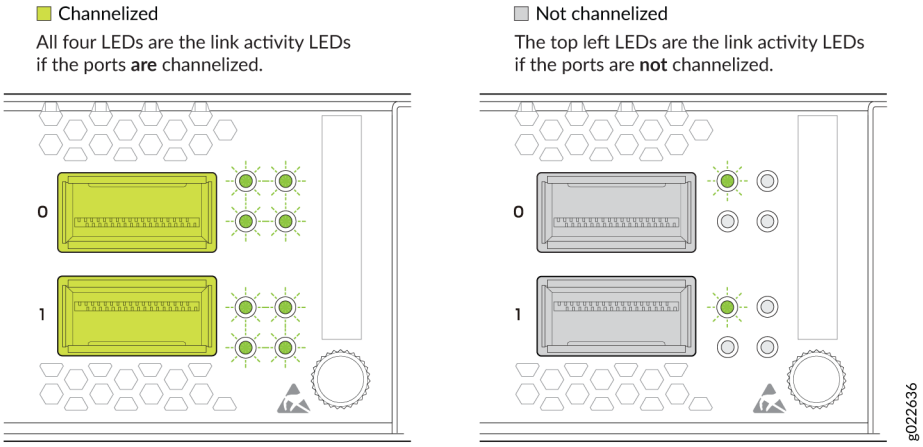


Figure 54: LEDs for the QSFP28 Ports on the EX4400-24X Model

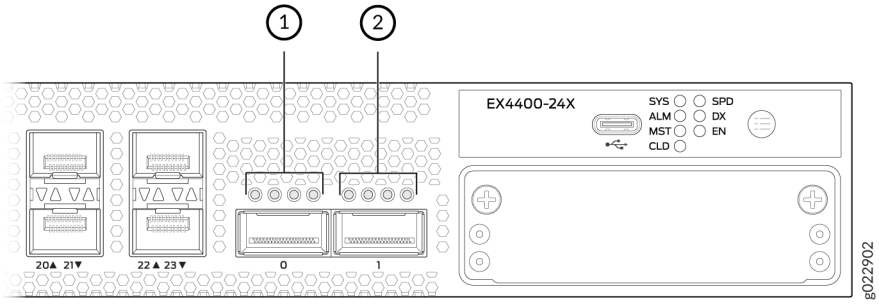


Figure 55: Link Activity LEDs for the QSFP28 Ports on the EX4400-24X Model

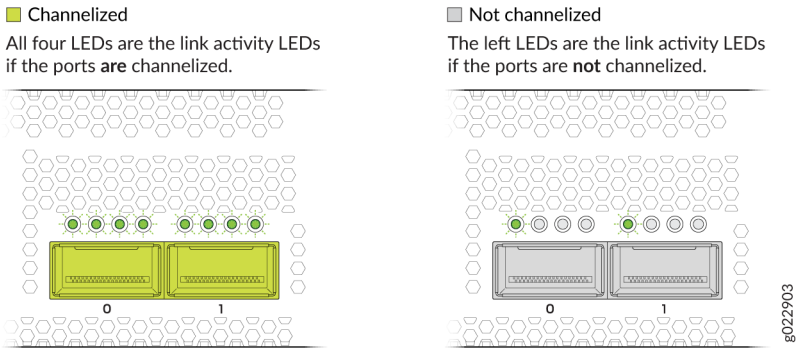


Table 38: Link Activity LED on the QSFP28 Ports

LED	Color	State and Description
Link activity (non-channelized ports)	Green	• On steadily—A 100-Gbps link is established, but there is no link activity. • Blinking—A 100-Gbps link is established, and there is link activity. • Off—There is no link.
	Amber **NOTE**: The support for 40-Gbps nonchannelized speed is available from Junos OS Release 22.1R1.	• On steadily—A 40-Gbps link is established, but there is no link activity. • Blinking—A 40-Gbps link is established, and there is link activity. • Off—There is no link.
All four LEDs (channelized ports). The LEDs correspond to the four channels.	Green	• On steadily—A 4x25-Gbps channelized link is established, but there is no link activity. • Blinking—A 4x25-Gbps channelized link is established, and there is link activity. • Off—There is no link.

Table 38: Link Activity LED on the QSFP28 Ports *(Continued)*

LED	Color	State and Description
	Amber	• On steadily—A 4x10-Gbps channelized link is established, but there is no link activity. • Blinking—A 4x10-Gbps channelized link is established, and there is link activity. • Off—There is no link.

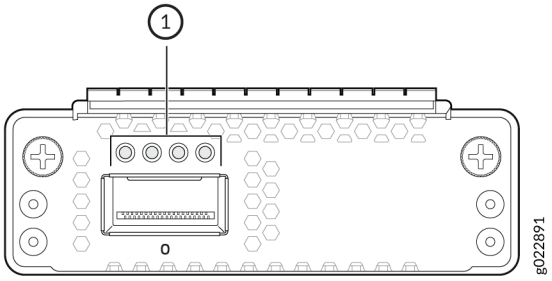
LEDs on the Extension Module Ports

Figure 56 on page 75 shows the LEDs on the 1x100GbE QSFP28 extension module port. Table 40 on page 76 describes the LEDs on that port.

Figure 57 on page 76 shows the LEDs on the 4x10GbE SFP+ extension module ports. Table 39 on page 76 describes the link activity LED on those ports and Table 41 on page 77 describes the status LED on those ports.

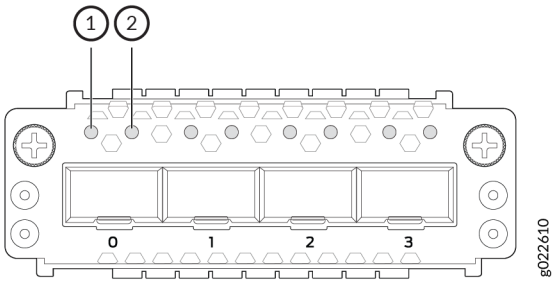
Figure 58 on page 78 shows the LEDs on the 4x25GbE SFP28 extension module ports. Table 39 on page 76 describes the link activity LED on those ports and Table 42 on page 78 describes the status LED on those ports.

Figure 56: LEDs on the 1x100GbE QSFP28 Extension Module Port



1– LEDs

Figure 57: LEDs on the 4x10GbE SFP+ Extension Module Ports



1– Link activity LED	2– Status LED

Table 39: Link Activity LED on the Extension Module Ports

Color	State and Description
Green	• On steadily—The port and the link are active, but there is no link activity. • Blinking—The port and the link are active, and there is link activity. • Unlit—The port is not active.

Table 40: LEDs on the 1x100GbE QSFP28 Extension Module Port

LED	Color	State and Description
The LED on the extreme left	Green	• On steadily—A 100-Gbps link is established, but there is no link activity. • Blinking—A 100-Gbps link is established, and there is link activity. • Off—There is no link.

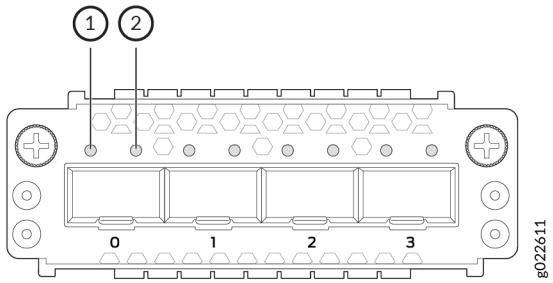
Table 40: LEDs on the 1x100GbE QSFP28 Extension Module Port *(Continued)*

LED	Color	State and Description
	Amber	• On steadily—A 40-Gbps link is established, but there is no link activity. • Blinking—A 40-Gbps link is established, and there is link activity. • Off—There is no link.
All four LEDs (channelized ports). The LEDs correspond to the four channels.	Green	• On steadily—A 4x25-Gbps channelized link is established, but there is no link activity. • Blinking—A 4x25-Gbps channelized link is established, and there is link activity. • Off—There is no link.
	Amber	• On steadily—A 4x10-Gbps channelized link is established, but there is no link activity. • Blinking—A 4x10-Gbps channelized link is established, and there is link activity. • Off—There is no link.

Table 41: Status LED on the 4x10GbE SFP+ Extension Module Ports

Color	State and Description
Green	Indicates the speed. The speed indicators are: • On steadily—10 Gbps • One blink per second—1000 Mbps • Unlit—The port is not active.

Figure 58: LEDs on the 4x25GbE SFP28 Extension Module Ports



1– Link activity LED	2– Status LED

Table 42: Status LED on the 4x25GbE SFP28 Extension Module Ports

Color	State and Description
Green	Indicates the speed. The speed indicators are: • On steadily—10 Gbps • Three blinks per second—25 Gbps • Unlit—The port is not active.

Cooling System and Airflow in an EX4400 Switch

IN THIS SECTION

The cooling system in an EX4400 switch consists of two fan modules for the chassis and a single built-in fan in each power supply. The airflow direction depends on the fan modules and power supplies installed in the switch. You can order an EX4400 switch that supports front-to-back (air enters through the front panel of the switch) or back-to-front airflow (air enters through the rear panel of the switch).

Fan Modules

The fan modules are hot-removable and hot-insertable field-replaceable units (FRUs) installed in the rear panel of the switch: You can remove and replace them without powering off the switch or disrupting switch functions.

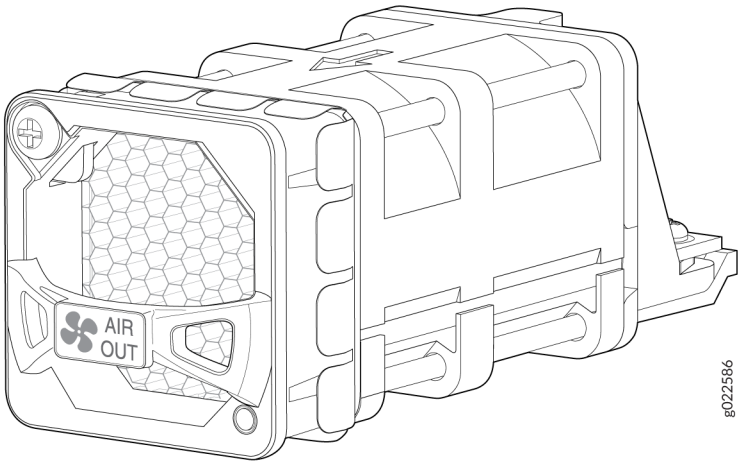
We ship EX4400 switches with two fan modules (1+1 redundancy) preinstalled in the rear panel of the switch. The fan module slots are numbered **0** and **1**, and each slot has a fan icon next to it.

The fan modules are available in two models that have different airflow directions:

- Front-to-back (cold air enters through the vents on the front panel of the switch and hot air exhausts through the vents on the rear panel), indicated by the **AIR OUT** label and the Juniper Gold handle.
- Back-to-front (cold air enters through the vents on the rear panel of the switch and hot air exhausts through the vents on the front panel), indicated by the **AIR IN** label and the Juniper Azure Blue handle.

Figure 59 on page 79 shows the fan module used in an EX4400 switch.

Figure 59: Fan Module Used in an EX4400 Switch



NOTE: You must install all the fan modules and they must be operational for optimal functioning of the switch.

Leave at least 4 in. (10.16 cm) clearance in front and 2 in. (5.08 cm) behind the chassis for airflow.

If the switch is operational while you are replacing fan modules, you must remove only one fan module at a time. The switch continues to operate for 60 seconds without thermal shutdown while you are replacing a fan module.

CAUTION: Do not mix:

- Fan modules with different airflow directions in the same chassis.
- Power supplies with different airflow directions in the same chassis.
- Power supplies and fan modules with different airflow directions in the same chassis.

If you install power supplies or fan modules with different airflow directions, Junos OS raises an alarm.

Under normal operating conditions, the fan modules operate at a moderate speed. Temperature sensors in the chassis monitor the temperature within the chassis.

If a fan module fails or if the ambient temperature inside the chassis rises above the acceptable range, Junos OS raises an alarm. If the temperature inside the chassis rises above the threshold temperature, the system shuts down automatically.

EX4400 Switches with Front-to-Back Airflow

In the EX4400 switch models that have front-to-back airflow, cold air enters the chassis through the vents on the front panel and hot air exhausts the chassis through the vents on the rear panel.

- Figure 60 on page 81 shows the front-to-back airflow through an EX4400-24T switch.
- Figure 61 on page 81 shows the front-to-back airflow through an EX4400-24P switch.
- Figure 62 on page 82 shows the front-to-back airflow through an EX4400-24MP switch.
- Figure 63 on page 82 shows the front-to-back airflow through an EX4400-24X switch.
- Figure 64 on page 83 shows the front-to-back airflow through an EX4400-48T switch.
- Figure 65 on page 83 shows the front-to-back airflow through an EX4400-48P switch.

- Figure 66 on page 84 shows the front-to-back airflow through an EX4400-48MP switch.
- Figure 67 on page 84 shows the front-to-back airflow through an EX4400-48F switch.

Figure 60: Front-to-Back Airflow Through an EX4400-24T Switch Chassis

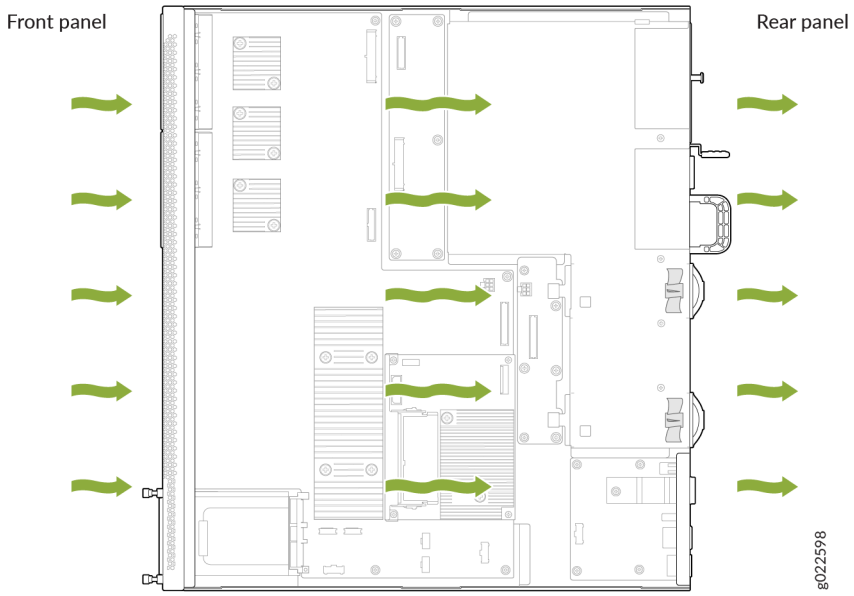


Figure 61: Front-to-Back Airflow Through an EX4400-24P Switch Chassis

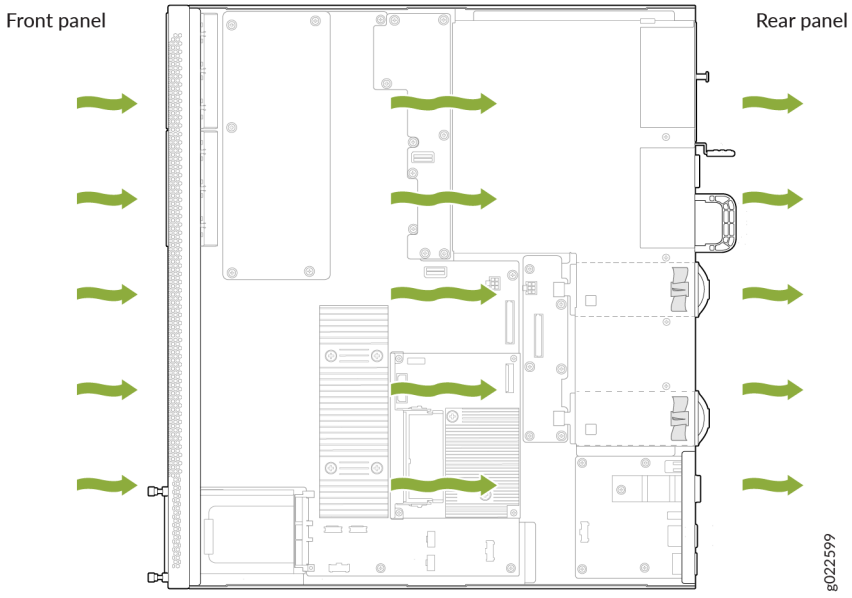


Figure 62: Front-to-Back Airflow Through an EX4400-24MP Switch Chassis

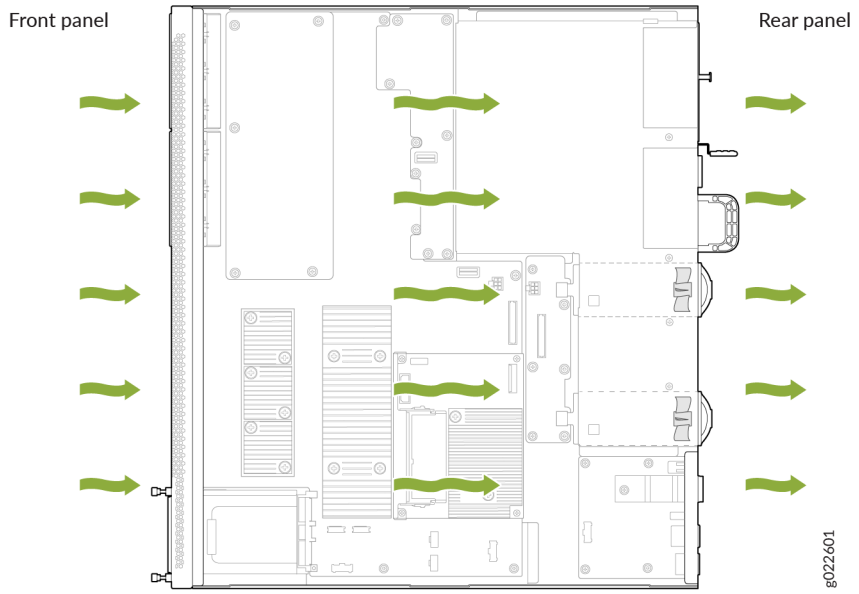


Figure 63: Front-to-Back Airflow Through an EX4400-24X Switch Chassis

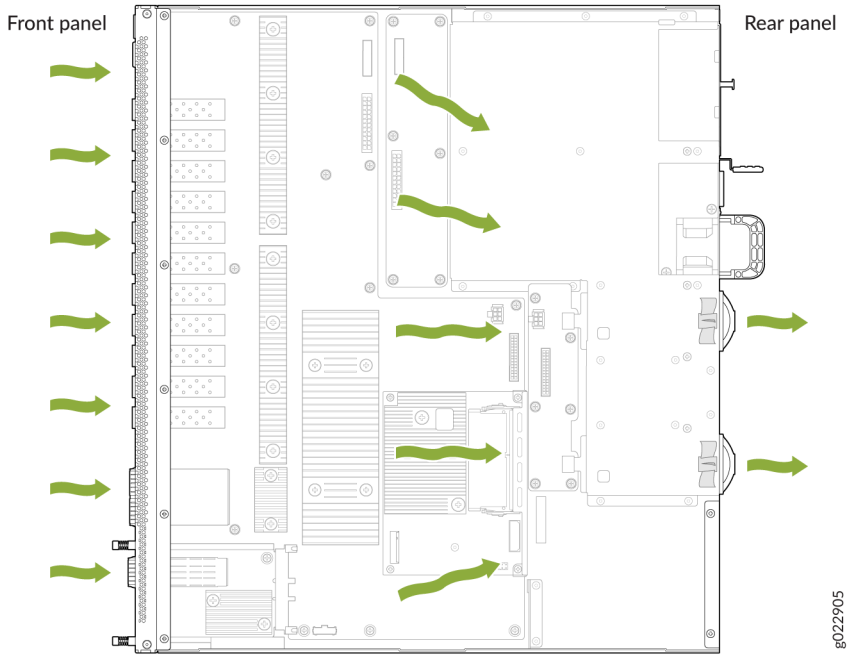


Figure 64: Front-to-Back Airflow Through an EX4400-48T Switch Chassis

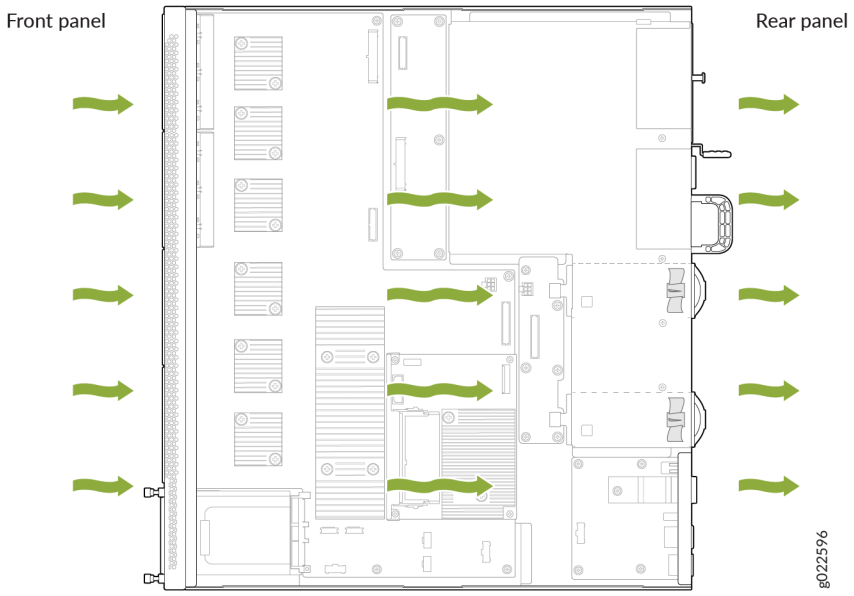


Figure 65: Front-to-Back Airflow Through an EX4400-48P Switch Chassis

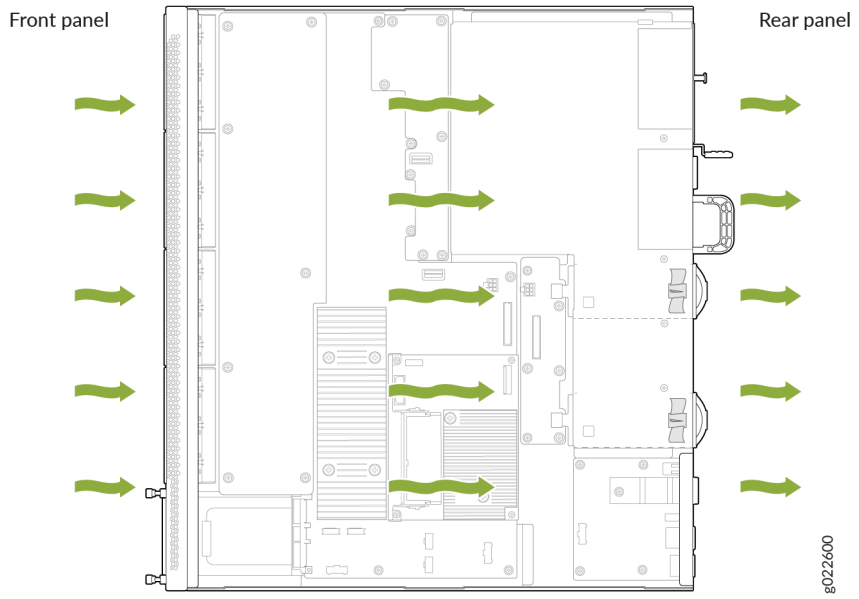


Figure 66: Front-to-Back Airflow Through an EX4400-48MP Switch Chassis

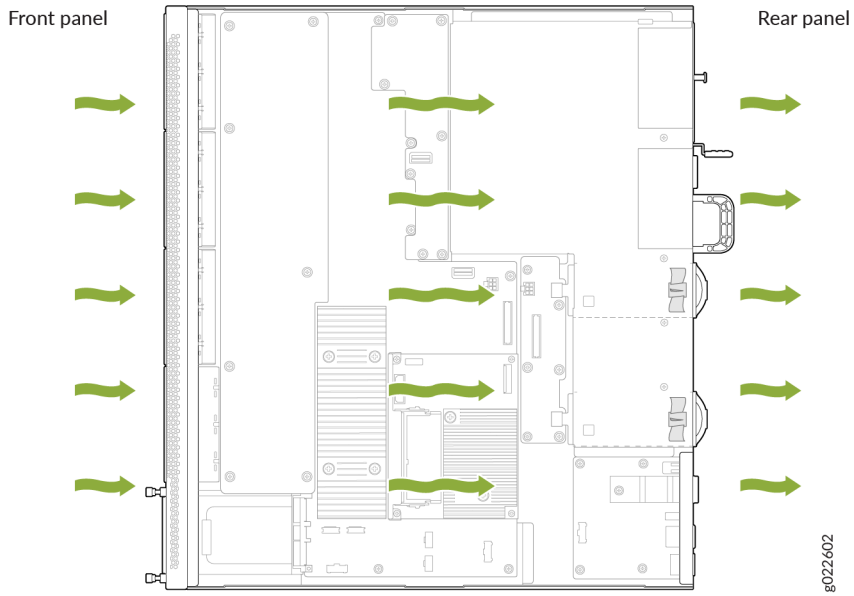
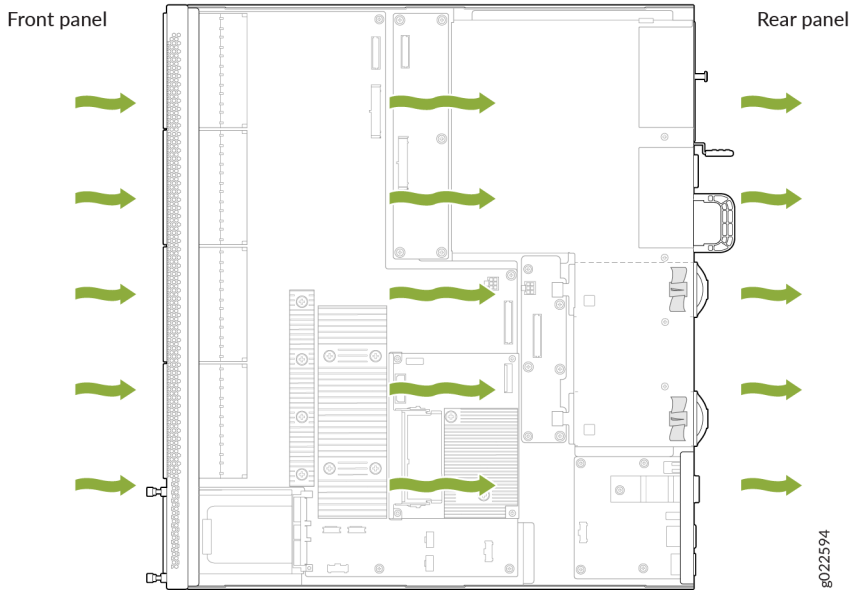


Figure 67: Front-to-Back Airflow Through an EX4400-48F Switch Chassis



Mixing components with different airflow directions in the same chassis hampers the performance of the cooling system of the switch and leads to overheating of the chassis.

EX4400 Switches with Back-to-Front Airflow

In the EX4400 switch models that have back-to-front airflow, cold air enters the chassis through the vents on the rear panel of the switch and hot air exhausts the chassis through the vents on the front panel.

- Figure 68 on page 85 shows the back-to-front airflow through an EX4400-24T switch.
- Figure 69 on page 86 shows the back-to-front airflow through an EX4400-24X switch.
- Figure 70 on page 86 shows the back-to-front airflow through an EX4400-48T switch.
- Figure 71 on page 87 shows the back-to-front airflow through an EX4400-48F switch.

Figure 68: Back-to-Front Airflow Through an EX4400-24T Switch Chassis

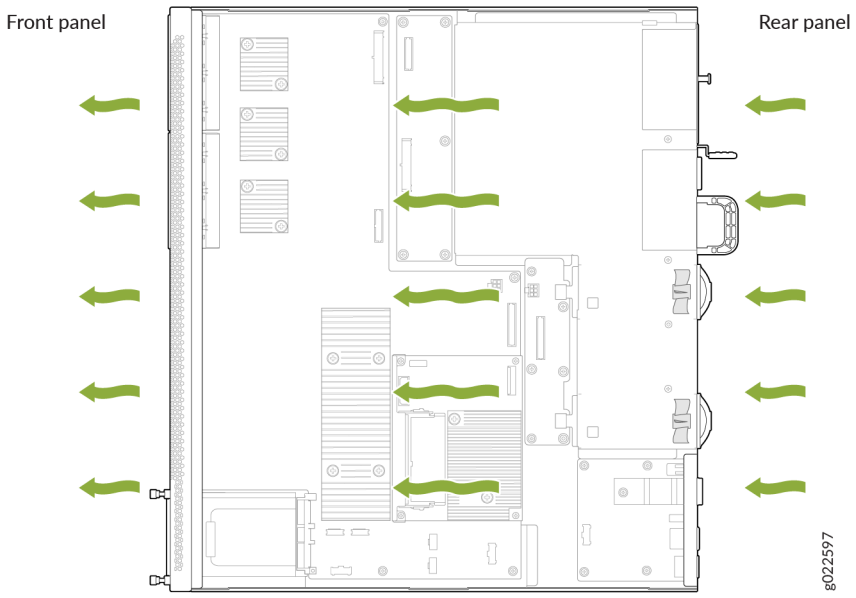


Figure 69: Back-to-Front Airflow Through an EX4400-24X Switch Chassis

Figure 70: Back-to-Front Airflow Through an EX4400-48T Switch Chassis

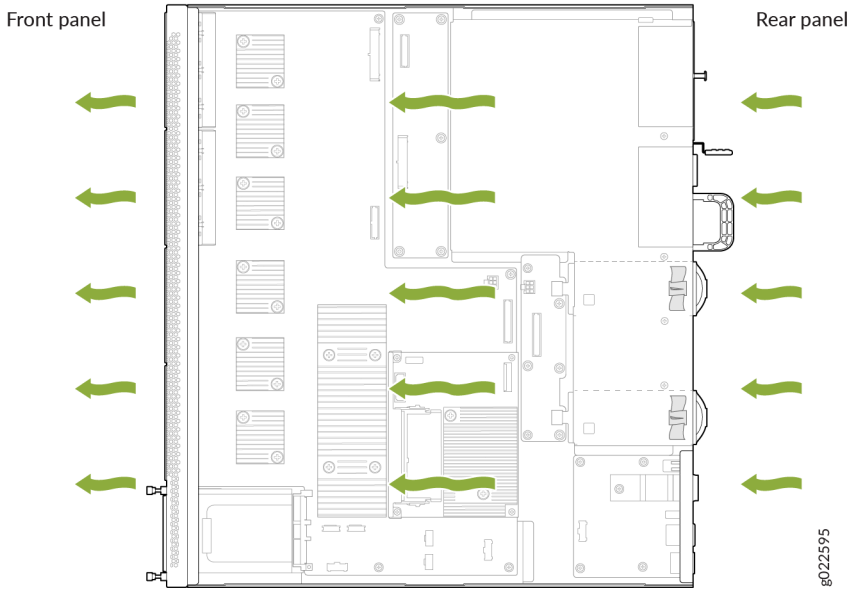
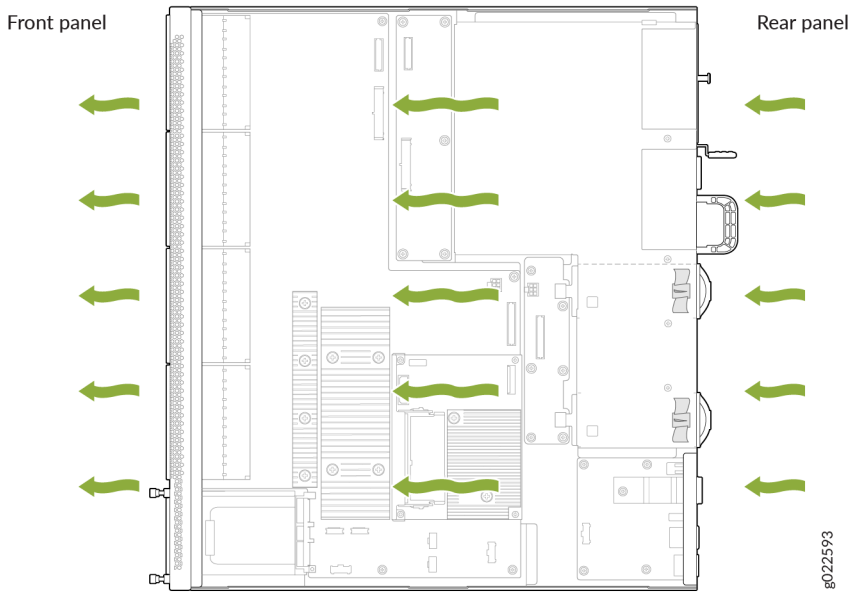


Figure 71: Back-to-Front Airflow Through an EX4400-48F Switch Chassis

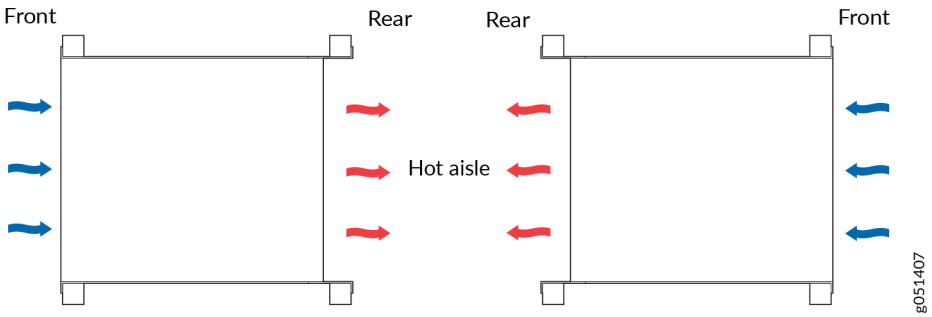


Mixing components with different airflow directions in the same chassis hampers the performance of the cooling system of the switch and leads to overheating of the chassis.

How to Position the Switch

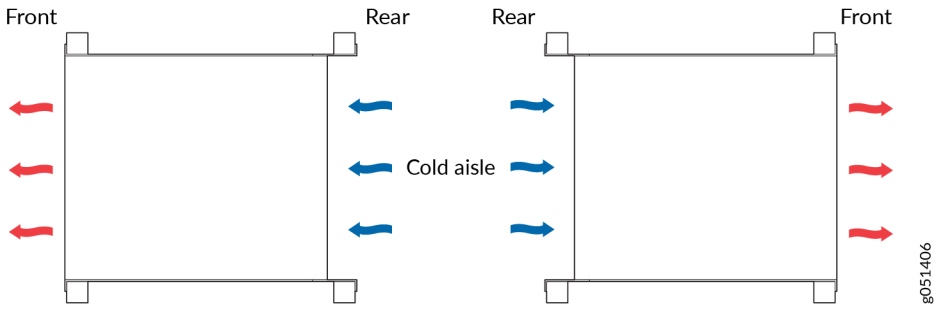
Position the switch with front-to-back airflow in such a manner that the **AIR OUT** labels on the fan modules and power supplies are next to the hot aisle (see Figure 72 on page 87).

Figure 72: Deployment of Switches with Front-to-Back Airflow Through the Switch Chassis



Position the switch with back-to-front airflow in such a manner that the **AIR IN** labels on the fan modules and power supplies are next to the cold aisle (see Figure 73 on page 88).

Figure 73: Deployment of Switches with Back-to-Front Airflow Through the Switch Chassis



Fan Module Status

Each fan module has a status LED on it that indicates the status of the fan module (see Figure 74 on page 88).

Figure 74: Fan Module LED

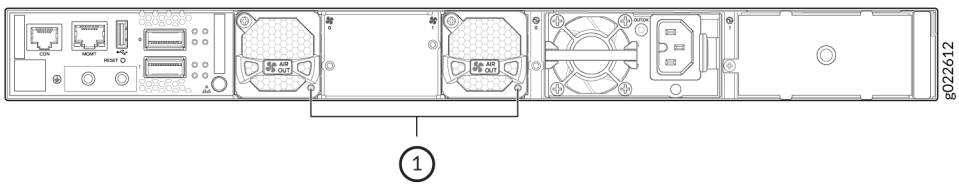


Table 43 on page 88 describes the LED.

Table 43: Fan Module Status LED

State	Description
Lit green	The fan module is functioning normally.

Table 43: Fan Module Status LED *(Continued)*

State	Description
Unlit	Indicates one of the following: • The fan module is not installed properly. • The fan module is not functioning normally. • The airflow direction of the fan module does not match with the airflow direction of the other components installed in the switch.

EX4400 Power System

IN THIS SECTION

AC Power Supply in EX4400 Switches

IN THIS SECTION

We ship the EX4400 switches with one power supply preinstalled in the rear panel of the switches. You can install up to two power supplies in the switch. You must order the second power supply and a power source cord separately. The power supply slots are numbered **0** and **1**, and each slot has a power icon next to it. The power supplies support front-to-back or back-to-front airflow directions. The power supplies are fully redundant, load-sharing, and hot-removable and hot-insertable field-replaceable units (FRUs) when the second power supply is installed and running. You can remove and replace either one of the power supplies without powering off the switch or disrupting switch functions.

Do not mix:

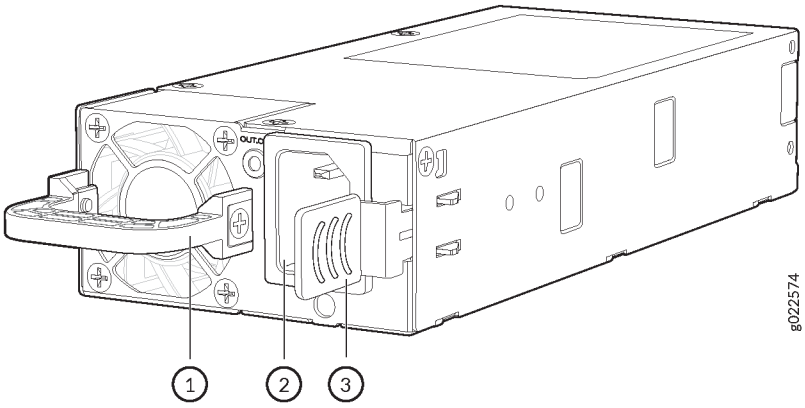
- AC and DC power supplies in the same chassis.
- Power supplies with different airflow directions in the same chassis.
- Fan modules with different airflow directions in the same chassis.
- Power supplies and fan modules with different airflow directions in the same chassis.

This topic describes the AC power supplies that EX4400 switches support.

Characteristics of the AC Power Supply

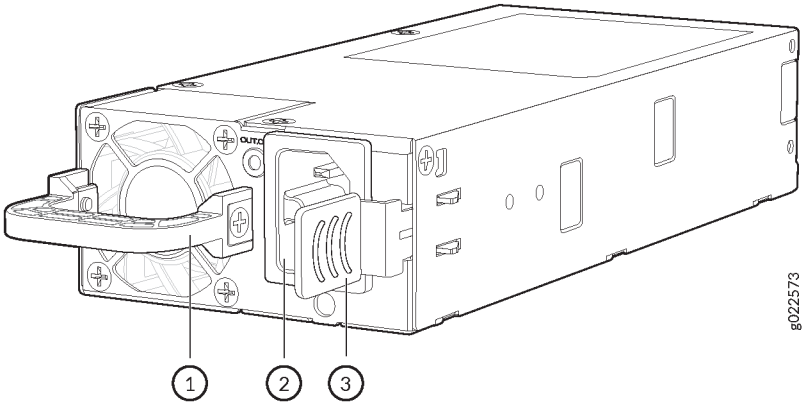
The AC power supplies for EX4400 switches come in 550-W, 1050-W, and 1600-W models. EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F switches support 550-W AC power supplies (see Figure 75 on page 91). EX4400-24P and EX4400-24MP switches support 1050W and 1600-W AC power supplies. These models support 1600-W AC power supply if you have Junos OS Release 22.3R1 or later installed. We ship the models with one 1050-W power supply. You can order the 1600-W power supply separately. You must not install different models of power supplies in the same chassis. EX4400-48P and EX4400-48MP switches support 1600-W AC power supplies). The AC power supplies support IEEE 802.3bt Power over Ethernet (PoE-bt) in EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP models.

Figure 75: 550-W AC Power Supply for EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F Switches



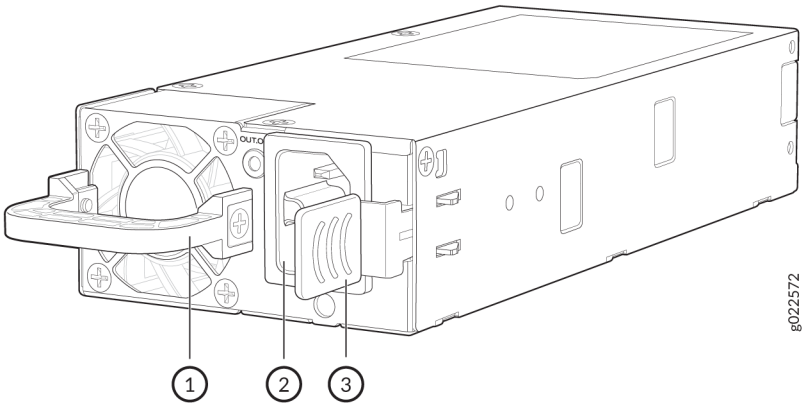
1– Power supply handle	3– Power supply ejector lever
2– Power supply inlet	

Figure 76: 1050-W AC Power Supply



1– Power supply handle	3– Power supply ejector lever
2– Power supply inlet	

Figure 77: 1600-W AC Power Supply



1– Power supply handle	3– Power supply ejector lever
2– Power supply inlet	

Table 44 on page 92 lists the details of the 550-W, 1050-W, and 1600-W AC power supplies used in EX4400 switches.

Table 44: Details of the AC Power Supplies in EX4400 Switches

Details		550-W AC Power Supply	1050-W AC Power Supply	1600-W AC Power Supply
Model number		• JPSU-550-C-AC-AFO • JPSU-550-C-AC-AFI	JPSU-1050-C-AC-AFO	JPSU-1600-C-AC-AFO
Minimum installed in chassis		1	1	1
Maximum installed in chassis		2	2	2
AC appliance inlet **NOTE**: Each AC appliance inlet requires a dedicated AC power feed.	Number	1	1	1
	Type	IEC-320-C13	IEC-320-C15	IEC-320-C15

Table 44: Details of the AC Power Supplies in EX4400 Switches *(Continued)*

Details	550-W AC Power Supply	1050-W AC Power Supply	1600-W AC Power Supply
Power supply status LED	**OUT.OK**	**OUT.OK**	**OUT.OK**

To prevent electrical injury while installing or removing AC power supplies, carefully follow instructions in "Install a Power Supply in an EX4400 Switch" on page 202 and "Remove a Power Supply from an EX4400 Switch" on page 200 .

Specifications of the AC Power Supplies Used in EX4400 Switches

- Table 45 on page 93 provides the power supply specifications of the 550-W AC power supplies.
- Table 46 on page 94 provides the power supply specifications of the 1050-W AC power supplies.
- Table 47 on page 94 provides the power supply specifications of the 1600-W AC power supplies.
- Table 48 on page 95 provides the typical power consumption for the EX4400 switch models. Typical power is the weighted power measured according to the TEER/ATIS 0600015 standard.

Table 45: Specifications of the 550-W AC Power Supplies Used in EX4400 Switches

Item	Specification
AC input voltage	• Low-voltage line: 100–127 VAC • High-voltage line: 200–240 VAC
AC input line frequency	47–63 Hz
AC input current rating	• Low-voltage line: 7.1 A • High-voltage line: 3.4 A
Output power	550 W
Efficiency	80-plus platinum efficiency certified

Table 46: Specifications of the 1050-W AC Power Supplies Used in EX4400 Switches

Item	Specification
AC input voltage	• Low-voltage line: 100–120 VAC • High-voltage line: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line: 12 A • High-voltage line: 6.05 A
Output power	1050 W
Efficiency	80-plus platinum efficiency certified

Table 47: Specifications of the 1600-W AC Power Supplies Used in EX4400 Switches

Item	Specification
AC input voltage	• Low-voltage line: 100–120 VAC • High-voltage line: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line: 12 A • High-voltage line: 9 A
Output power	1600 W
Efficiency	80-plus platinum efficiency certified

Table 48: Typical Power Consumption for the EX4400 Switch Models

Model	Typical Power Consumption
EX4400-24T	90 W
EX4400-24P	When PoE is drawn: 1598 W
	When PoE is not drawn: 107 W
EX4400-24MP	When PoE is drawn: 1860 W
	When PoE is not drawn: 138 W
EX4400-24X	126 W
EX4400-48T	96 W
EX4400-48P	When PoE is drawn: 1964 W
	When PoE is not drawn: 135 W
EX4400-48F	116.5 W
EX4400-48MP	When PoE is drawn: 2484 W
	When PoE is not drawn: 183 W

AC Power Supply Airflow

Each power supply has its own fan and is cooled by its own internal cooling system. EX4400 switches support power supplies with the following airflow directions:

- Front-to-back (cold air enters through the vents on the front panel of the switch and hot air exhausts through the vents on the rear panel), indicated by the **AIR OUT** label and the Juniper Gold handle.

- Back-to-front (cold air enters through the vents on the rear panel of the switch and hot air exhausts through the vents on the front panel), indicated by the **AIR IN** label and the Juniper Azure Blue handle.

Table 49 on page 96 lists the AC power supply models and the direction of airflow in them.

Table 49: Airflow Direction in AC Power Supply Models for EX4400 Switches

Model	Direction of Airflow
• JPSU-550-C-AC-AFO • JPSU-1050-C-AC-AFO • JPSU-1600-C-AC-AFO	Front-to-back—that is, cold air enters the chassis through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis, indicated by the **AIR OUT** label and the Juniper Gold handle.
JPSU-550-C-AC-AFI	Back-to-front—that is, cold air enters the chassis through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis, indicated by the **AIR IN** label and the Juniper Azure Blue handle.

Specifications of the Power Cord for AC Power Supplies for EX4400 Switches

Each AC power supply has a single AC appliance inlet that requires a dedicated AC power feed. A detachable AC power cord is supplied with each AC power supply. We ship the 550-W AC power supplies with AC power cords with the C13 coupler type and the 1050-W and the 1600-W AC power supplies with the C15 coupler type as described by International Electrotechnical Commission (IEC) standard 60320. The plug end of the power cord fits into the power source outlet that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 14.75 ft (4.5 m) in length, to comply with National Electrical Code (NEC) Section 400-8 (NFPA 75, 5-2.2) and Canadian Electrical Code (CEC) Section 4-010(3).

Table 50 on page 97 lists the AC power cords specifications provided for the 550-W power supplies for each country or region.

Table 50: AC Power Cord Specifications for 550-W AC Power Supplies for EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F Switches

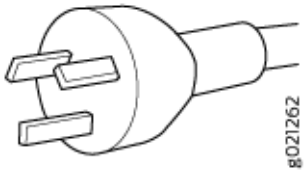
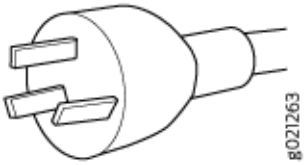
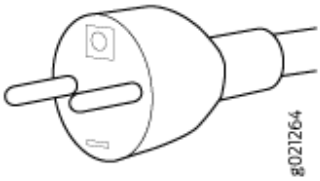
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR	No graphic available
Australia	250 VAC, 10 A, 50 Hz	AS/NZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU	
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR	No graphic available
China	250 VAC, 10 A, 50 Hz	GB 1002-1996 Type PRC/3	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C13-EU	
India	250 VAC, 10 A, 50 Hz	IS 1293 Type IND/3	CBL-EX-PWR-C13-IN	No graphic available

Table 50: AC Power Cord Specifications for 550-W AC Power Supplies for EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F Switches *(Continued)*

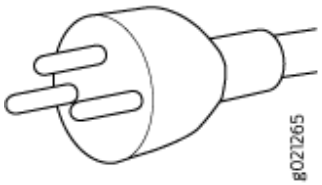
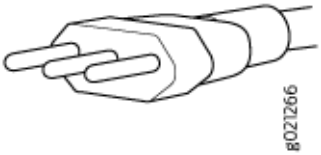
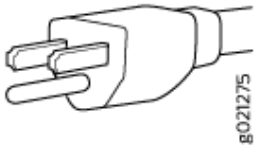
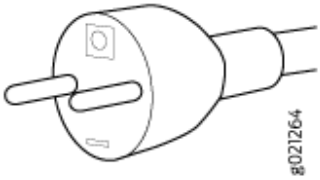
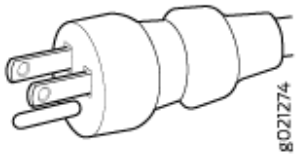
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL	 g021265
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-EX-PWR-C13-IT	 g021266
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	SS-00259 Type VCTF	CBL-EX-PWR-C13-JP	 g021275
Korea	250 VAC, 10 A, 50 Hz or 60 Hz	CEE (7) VII Type VIIGK	CBL-EX-PWR-C13-KR	 g021264
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15 Type N5-15	CBL-EX-PWR-C13-US	 g021274

Table 50: AC Power Cord Specifications for 550-W AC Power Supplies for EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F Switches *(Continued)*

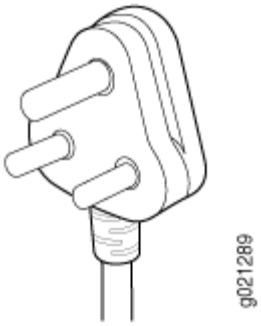
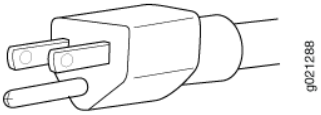
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C13-SA	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ	No graphic available
Taiwan	125 VAC, 10 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C13-UK	

Table 51 on page 100 lists the AC power cords specifications provided for the 1050-W and 1600-W power supplies for each country or region.

Table 51: AC Power Cord Specifications for 1050-W and 1600-W Power Supplies for EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP Switches

Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-PWR-C15M-HITEMP-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112-2000 Type SAA/3	CBL-PWR-C15M-HITEMP-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-PWR-C15M-HITEMP-BR
China	250 VAC, 10 A, 50 Hz	GB2099, GB1002 Type PRC/3	CBL-PWR-C15M-HITEMP-CH
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-EU
Israel	250 VAC, 10 A, 50 Hz	SI 32 Type IL/3G	CBL-PWR-C15M-HITEMP-IL
India	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-IN
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-PWR-C15M-HITEMP-IT
Japan	125 VAC, 15 A, 50 Hz or 60 Hz	JIS 8303 Type 498GJ	CBL-PWR-C15M-HITEMP-JP
Korea	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-KR

Table 51: AC Power Cord Specifications for 1050-W and 1600-W Power Supplies for EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP Switches *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-SA
North America	125 VAC, 15 A, 60 Hz	NEMA 5-15 Type N5/15	CBL-PWR-C15M-HITEMP-US
North America	250 VAC, 15 A, 60 Hz	NEMA 6-15 Type N6/15	CBL-PWR-C15M-HITEMP-US (250)
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 / 6534-2 Type 12G	CBL-PWR-C15M-HITEMP-SZ
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-PWR-C15M-HITEMP-UK

CAUTION: You must use the AC power cord for the EX4400 switch with this switch only. Do not use the cord with any other product.

CAUTION: Power cords must not block access to switch components.

PoE-bt Budget Planning

Table 52 on page 102 lists the PoE-bt power available in an EX4400-24P switch.

Table 52: PoE-bt Power Available in an EX4400-24P Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	**2**		
1050 W	–	110 V	783 W
		230 V	783 W
1050 W	1050 W	110 V	1806 W
		230 V	1806 W
1600 W	–	110 V	783 W
		230 V	1320 W
1600 W	1600 W	110 V	1806 W
		230 V	2160 W

Table 53 on page 102 lists the PoE-bt power available in an EX4400-24P switch if Junos OS Release 22.2R1 or earlier is installed in the switch.

Table 53: PoE-bt Power Available in an EX4400-24P Switch if Junos OS Release 22.2R1 or Earlier is Installed in the Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1050 W	–	110 V	788 W
		230 V	788 W

Table 53: PoE-bt Power Available in an EX4400-24P Switch if Junos OS Release 22.2R1 or Earlier is Installed in the Switch *(Continued)*

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1050 W	1050 W	110 V	1440 W
		230 V	1440 W

Table 54 on page 103 lists the PoE-bt power available in an EX4400-24MP switch.

Table 54: PoE-bt Power Available in an EX4400-24MP Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1050 W	–	110 V	753 W
		230 V	753 W
1050 W	1050 W	110 V	1776 W
		230 V	1776 W
1600 W	–	110 V	753 W
		230 V	1290 W
1600 W	1600 W	110 V	1776 W
		230 V	2160 W

Table 55 on page 104 lists the PoE-bt power available in an EX4400-24MP switch if Junos OS Release 22.2R1 or earlier is installed in the switch.

Table 55: PoE-bt Power Available in an EX4400-24MP Switch if Junos OS Release 22.2R1 or Earlier is Installed in the Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1050 W	–	110 V	780 W
		230 V	780 W
1050 W	1050 W	110 V	1800 W
		230 V	1800 W

Table 56 on page 104 lists the PoE-bt power available in an EX4400-48P switch.

Table 56: PoE-bt Power Available in an EX4400-48P Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1600 W	–	110 V	773 W
		230 V	1310 W
1600 W	1600 W	110 V	1796 W
		230 V	2200 W

Table 57 on page 105 lists the PoE-bt power available in an EX4400-48P switch if Junos OS Release 22.2R1 or earlier is installed in the switch.

Table 57: PoE-bt Power Available in an EX4400-48P Switch if Junos OS Release 22.2R1 or Earlier is Installed in the Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1600 W	–	110 V	768 W
		230 V	1290 W
1600 W	1600 W	110 V	1440 W
		230 V	1800 W

Table 58 on page 105 lists the PoE-bt power available in an EX4400-48MP switch.

Table 58: PoE-bt Power Available in an EX4400-48MP Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1600 W	–	110 V	723 W
		230 V	1260 W
1600 W	1600 W	110 V	1746 W
		230 V	2200 W

Table 59 on page 106 lists the PoE-bt power available in an EX4400-48MP switch if Junos OS Release 22.2R1 or earlier is installed in the switch.

Table 59: PoE-bt Power Available in an EX4400-48MP Switch if Junos OS Release 22.2R1 or Earlier is Installed in the Switch

Power Supply		Input Voltage	Available PoE-bt Power
1	2		
1600 W	–	110 V	750 W
		230 V	1300 W
1600 W	1600 W	110 V	1800 W
		230 V	2200 W

DC Power Supply in EX4400 Switches

IN THIS SECTION

We ship the EX4400 switches with one power supply installed in the rear panel of the switches. You can install up to two power supplies in the switch. You must order the second power supply and a power source cord (part number: CBL-JNP-PWR-DSUB) separately. The power supply slots are numbered **0** and **1** and each slot has a power icon next to it. The power supplies support front-to-back or back-to-front airflow directions. The power supplies are fully redundant, load-sharing, and hot-removable and hot-insertable field-replaceable units (FRUs) when the second power supply is installed and running: You can remove and replace either one of them without powering off the switch or disrupting switch functions.

Do not mix:

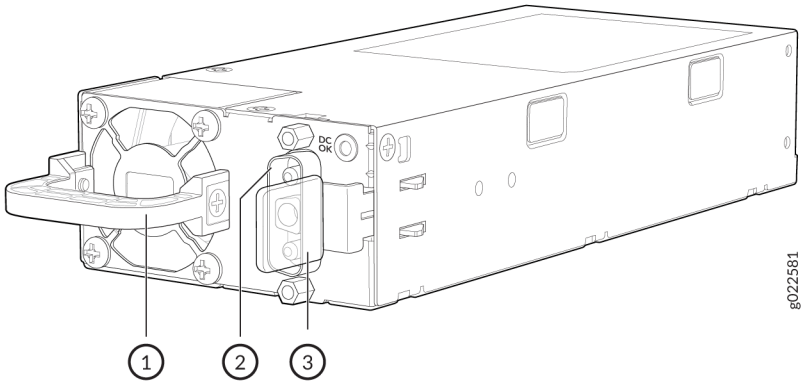
- AC and DC power supplies in the same chassis.
- Power supplies with different airflow directions in the same chassis.
- Fan modules with different airflow directions in the same chassis.
- Power supplies and fan modules with different airflow directions in the same chassis.

This topic describes the DC power supplies that EX4400 switches support.

Characteristics of the DC Power Supply

DC-powered EX4400-24T, EX4400-24X, EX4400-48T, and EX4400-48F switches support 550-W DC power supplies (see Figure 78 on page 107).

Figure 78: 550 W DC Power Supply for EX4400 Switches



1– Power supply handle	3– Power supply ejector lever
2– Power supply inlet	

Table 60 on page 107 lists the details of the 550-W DC power supplies used in EX4400 switches.

Table 60: Details of the DC Power Supplies in EX4400 Switches

Details	550-W DC Power Supplies
Model number	• JPSU-550-C-DC-AFO • JPSU-550-C-DC-AFI

Table 60: Details of the DC Power Supplies in EX4400 Switches *(Continued)*

Details	550-W DC Power Supplies
Minimum installed in chassis	1
Maximum installed in chassis	2
Power supply status LED	**DC.OK**

To prevent electrical injury while installing or removing DC power supplies, carefully follow instructions in "Install a Power Supply in an EX4400 Switch" on page 202 and "Remove a Power Supply from an EX4400 Switch" on page 200 .

Specifications of the DC Power Supplies Used in EX4400 Switches

Table 61 on page 108 provides the power supply specifications of the 550-W DC power supplies.

Table 62 on page 108 provides the typical power consumption for the EX4400 switch models.

Table 61: Specifications of the 550-W DC Power Supplies Used in EX4400 Switches

Item	Specification
DC input voltage	Rated operating voltage: –48 VDC through –60 VDC
DC input current rating	13 A
Output power	550 W

Table 62: Typical Power Consumption for the EX4400 Switch Models

Model	Typical Power Consumption
EX4400-24T	95.8 W
EX4400-24X	126 W

Table 62: Typical Power Consumption for the EX4400 Switch Models *(Continued)*

Model	Typical Power Consumption
EX4400-48T	102.7 W
EX4400-48F	128.6 W

DC Power Supply Airflow

Each power supply has its own fan and is cooled by its own internal cooling system. EX4400 switches support power supplies with the following airflow directions:

- Front-to-back (cold air enters through the vents on the front panel of the switch and hot air exhausts through the vents on the rear panel), indicated by the **AIR OUT** label and the Juniper Gold handle.
- Back-to-front (cold air enters through the vents on the rear panel of the switch and hot air exhausts through the vents on the front panel), indicated by the **AIR IN** label and the Juniper Azure Blue handle.

Table 63 on page 109 lists the DC power supply models and the direction of airflow in them.

Table 63: Airflow Direction in DC Power Supply Models for EX4400 Switches

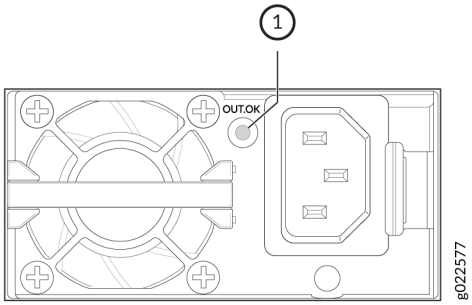
Model	Direction of Airflow
JPSU-550-C-DC-AFO	Front-to-back—that is, cold air enters the chassis through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis, indicated by the **AIR OUT** label and the Juniper Gold handle.
JPSU-550-C-DC-AFI	Back-to-front—that is, cold air enters the chassis through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis, indicated by the **AIR IN** label and the Juniper Azure Blue handle.

Power Supply LEDs in EX4400 Switches

The power supplies for EX4400 switches have one LED that indicates its state.

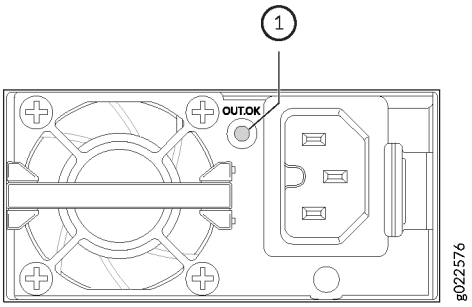
- Figure 79 on page 110 shows the LED on the 550-W AC power supply for EX4400 switches.
- Figure 80 on page 110 shows the LED on the 1050-W AC power supply for EX4400 switches.
- Figure 81 on page 111 shows the LED on the 1600-W AC power supply for EX4400 switches.
- Figure 82 on page 111 shows the LED on the 550-W DC power supply for EX4400 switches.

Figure 79: LED on the 550-W AC Power Supply for EX4400 Switches



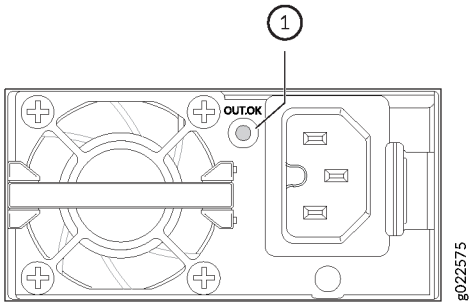
1– Power supply LED

Figure 80: LED on the 1050-W AC Power Supply for EX4400 Switches



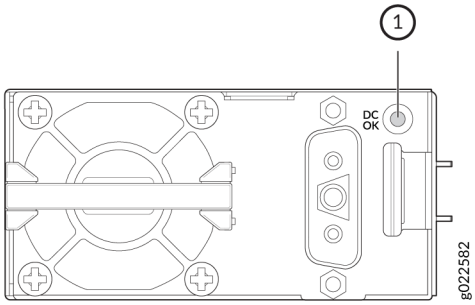
1– Power supply LED

Figure 81: LED on the 1600-W AC Power Supply for EX4400 Switches



1– Power supply LED

Figure 82: LED on the 550-W DC Power Supply for EX4400 Switches



1– Power supply LED

Table 64 on page 111 describes the power supply LED.

Table 64: Power Supply LED in EX4400 Switches

Color	State	Description
Green	On steadily	The power supply is receiving input and is providing proper output to the switch.
	Blinking	The fan in the power supply has failed or there is an internal communication failure in the power supply; you must replace it.

Table 64: Power Supply LED in EX4400 Switches *(Continued)*

Color	State	Description
	Unlit	Indicates one of the following: • The power cord might not be installed properly. • The power supply is not receiving power correctly. Verify that the input voltage range is correct. • The power supply is in standby mode. • The ambient temperature is high and the power supply has shut down. Ensure that the temperature is between 32° F and 113° F (between 0° C and 45° C). • There is a critical failure in the power supply and it has shut down. You must replace it.

CHAPTER 3

Site Planning and Preparation

Site Preparation Checklist for EX4400 Switches

The checklist in Table 65 on page 114 summarizes the tasks you need to perform when preparing a site for EX4400 switch installation.

Table 65: Site Preparation Checklist

Item or Task	For More Information	Performed by	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed switch tolerances.	"Environmental Requirements and Specifications for EX4400 Switches" on page 117		
Power			
Measure the distance between external power sources and the switch installation site.	"Clearance Requirements for Hardware Maintenance for EX4400 Switches" on page 122		
Locate sites to connect system grounding.			
Calculate the power consumption and requirements.	• "AC Power Supply in EX4400 Switches" on page 89 • "DC Power Supply in EX4400 Switches" on page 106		
Hardware Configuration			
Choose the number and types of switches you want to install.	"EX4400 Switches Hardware Overview" on page 8		
Rack or Cabinet			

Table 65: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Verify that the rack or cabinet meets the minimum requirements for installing the switch.	• "Rack Requirements" on page 120 • "Cabinet Requirements" on page 121		
Plan rack or cabinet location, including required space clearances.			
Secure the rack or cabinet to the floor and building structure.			
Cables			

Table 65: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of the cable based on the distance between the hardware components being connected. **NOTE**: The Ethernet cables to connect to the RJ-45 network ports on EX4400-24P, EX4400-24MP, EX4400-48P, and EX4400-48MP switches provide 90-W power over 4-pair wire. To ensure that the cables do not exceed the rated temperature and ampacity and to ensure proper operation, the cables must meet the following specifications related to deployment, temperature rise, category, IEEE, UL, NEC, and local electric codes: • The cables must be rated for IEEE 802.3 BT, TIA standards, and UL-LP. • The cables must follow NEC 725.144 article and local electric code. • The operating temperature of the cable must be rated at 15° C more than the ambient temperature.			

Table 65: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Plan the cable routing and management.			

EX4400 Site Guidelines and Requirements

IN THIS SECTION

Environmental Requirements and Specifications for EX4400 Switches

You must install the switch in a rack or cabinet. You must house it in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- Keep the site as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the switch cooling system.
- Maintain ambient airflow for normal switch operation. If the airflow is blocked or restricted, or if the intake air is too warm, the switch might overheat, leading to the switch temperature monitor shutting down the device to protect the hardware components.

Table 66 on page 118 provides the required environmental conditions for normal switch operation for EX4400.

Table 66: EX4400 Environmental Tolerances

Altitude	Relative Humidity	Temperature	Seismic
No performance degradation up to 6000 feet at 104° F (1828.8 meters at 40° C)	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing	• Normal operation ensured in temperature range of 32° F through 113° F (0° C through 45° C) • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)	Tested for Zone 4 earthquake according to NEBS GR-63-CORE, Issue 5.

NOTE: Install the EX4400 only in restricted-access areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70. Only skilled and instructed persons must access the device.

General Site Guidelines

Efficient device operation requires proper site planning and maintenance. It also requires proper layout of the equipment, rack or cabinet, and wiring closet.

To plan and create an acceptable operating environment for your device and prevent environmentally caused equipment failures:

- Keep the area around the chassis free from dust and conductive material, such as metal flakes.
- Follow prescribed airflow guidelines to ensure that the cooling system functions properly. Ensure that exhaust from other equipment does not blow into the intake vents of the device.
- Follow the prescribed electrostatic discharge (ESD) prevention procedures to prevent damaging the equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install the device in a secure area, so that only authorized personnel can access the device.

Site Electrical Wiring Guidelines

Table 67 on page 119 describes the factors you must consider while planning the electrical wiring at your site.

WARNING: You must provide a properly grounded and shielded environment and use electrical surge-suppression devices.

Avertissement Vous devez établir un environnement protégé et convenablement mis à la terre et utiliser des dispositifs de parasurtension.

Table 67: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Strong sources of electromagnetic interference (EMI) can cause: • Destruction of the signal drivers and receivers in the device, • Electrical hazards as a result of power surges conducted over the lines into the equipment.

Rack Requirements

You can mount the device on two-post racks or four-post racks.

Rack requirements consist of:

- Rack type.
- Mounting bracket hole spacing.
- Rack size and strength.
- Rack connection to the building structure.

Table 68 on page 120 provides the rack requirements and specifications.

Table 68: Rack Requirements and Specifications

Rack Requirement	Guidelines
Rack type	A U is the standard rack unit defined by the Electronic Components Industry Association (http://www.ecianow.org). You can mount the device on a rack that provides bracket holes or hole patterns spaced at 1U (1.75 in. or 4.45 cm) increments and meets the size and strength requirements to support the weight.
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1U (1.75 in. or 4.45 cm) so that the device can be mounted in any rack that provides holes spaced at that distance.
Rack size and strength	Ensure that the: • Rack complies with the size and strength standards of a 19-in. rack as defined by the Electronic Components Industry Association (http://www.ecianow.org). • Rack rails are spaced widely enough to accommodate the external dimensions of the device chassis. Ensure also that the outer edges of the front mounting brackets extend the width of the chassis to 19 in. (48.2 cm). • Rack is strong enough to support the weight of the device. • Spacing of rails and adjacent racks provides for proper clearance around the device and rack.

Table 68: Rack Requirements and Specifications *(Continued)*

Rack Requirement	Guidelines
Rack connection to building structure	Secure the rack as follows: • Secure the rack to the building structure. • If your geographical area is earthquake-prone, secure the rack to the floor. • Secure the rack to the ceiling brackets as well as wall or floor brackets for maximum stability.

SEE ALSO

Rack-Mounting and Cabinet-Mounting Warnings

Cabinet Requirements

You can mount the device in a cabinet that contains a 19-in. rack.

Cabinet requirements consist of:

- Cabinet size.
- Clearance requirements.
- Cabinet airflow requirements.

Table 69 on page 121 provides the cabinet requirements and specifications.

Table 69: Cabinet Requirements and Specifications

Cabinet Requirement	Guidelines
Cabinet size	• The minimum cabinet size is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce chances of overheating.

Table 69: Cabinet Requirements and Specifications *(Continued)*

Cabinet Requirement	Guidelines
Cabinet clearance	• The outer edges of the front mounting brackets extend the width of the chassis to 19 in. (48.2 cm). • The minimum total clearance inside the cabinet is 30.7 in. (78 cm) between the inside of the front door and the inside of the rear door.
Cabinet airflow requirements	When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating, as follows: • Ensure adequate cool air supply to dissipate the thermal output of the device or devices. • Ensure that the hot air exhaust of the chassis exits the cabinet without recirculating into the device. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top ensures the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. • Install the device in the cabinet in a way that maximizes the open space on the side of the chassis that has the hot air exhaust. • Route and secure all cables to minimize the blockage of airflow to and from the chassis. • Ensure that the spacing of rails and adjacent cabinets is such that proper clearance exists around the device and cabinet. • A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.

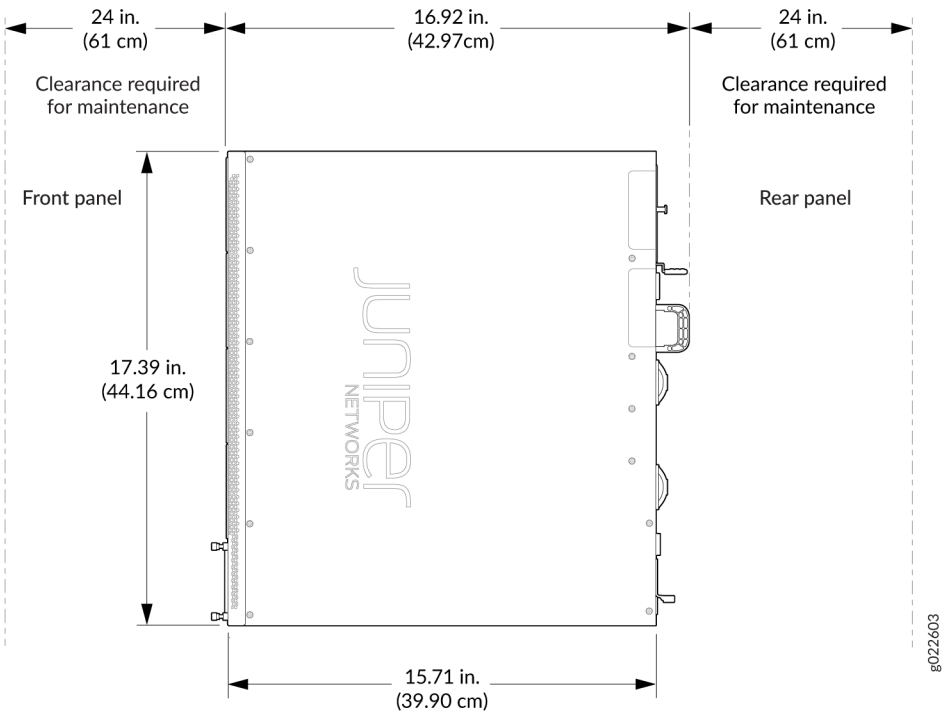
Clearance Requirements for Hardware Maintenance for EX4400 Switches

When planning the site for installing an EX4400 switch, follow these clearance requirements (see Figure 83 on page 123):

- For the cooling system to function properly, ensure that the airflow around the chassis is unrestricted.

- If you are mounting the switch on a rack or cabinet along with other equipment, ensure that the hot air exhaust from other equipment does not blow into the cold air intake vents of the chassis.
- Leave at least 6 in. (15.2 cm) clearance in front of and behind the chassis.
- NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.
- Leave at least 24 in. (61 cm) clearance in front of and behind the switch for service personnel to remove and install hardware components.

Figure 83: Clearance Requirements for Hardware Maintenance for EX4400 Switches



EX4400 Network Cable and Transceiver Planning

IN THIS SECTION

Pluggable Transceivers and Cables Supported on EX4400 Switches

You can find the list of transceivers and cables supported on EX4400 switches and information about those transceivers and cables at the Hardware Compatibility Tool page for EX4400.

NOTE: We recommend that you use only optical transceivers, optical connectors, and cables purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you face a problem running a Juniper Networks device that uses a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

CAUTION: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the

third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

The Gigabit Ethernet transceivers installed in EX4400 switches support digital optical monitoring (DOM): You can view the diagnostic details for these transceivers by issuing the operational mode CLI command `show interfaces diagnostics optics`.

NOTE: The transceivers support DOM even if they are installed in ports configured as Virtual Chassis ports (VCPs).

RJ-45 Port, SFP Port, SFP+ Port, QSFP+ Port, and QSFP28 Port Connector Pinout Information

The tables in this topic describe the connector pinout information for the RJ-45, QSFP+, QSFP28, SFP+, and SFP ports.

- Table 70 on page 125 —10/100/1000BASE-T Ethernet network port connector pinout information
- Table 71 on page 126 —SFP network port connector pinout information
- Table 72 on page 128 —SFP+ network port connector pinout information
- Table 73 on page 129 —QSFP+ and QSFP28 network module ports connector pinout information

Table 70: 10/100/1000BASE-T Ethernet Network Port Connector Pinout Information

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1 Negative Vport (in PoE models)

Table 70: 10/100/1000BASE-T Ethernet Network Port Connector Pinout Information *(Continued)*

Pin	Signal	Description
2	TRP1-	Transmit/receive data pair 1 Negative Vport (in PoE models)
3	TRP2+	Transmit/receive data pair 2 Positive Vport (in PoE models)
4	TRP3+	Transmit/receive data pair 3
5	TRP3-	Transmit/receive data pair 3
6	TRP2-	Transmit/receive data pair 2 Positive Vport (in PoE models)
7	TRP4+	Transmit/receive data pair 4
8	TRP4-	Transmit/receive data pair 4

Table 71: SFP Network Port Connector Pinout Information

Pin	Signal	Description
1	VeeT	Module transmitter ground
2	TX_Fault	Module transmitter fault
3	TX_Disable	Transmitter disabled
4	SDA	2-wire serial interface data line
5	SCL-	2-wire serial interface clock

Table 71: SFP Network Port Connector Pinout Information *(Continued)*

Pin	Signal	Description
6	MOD_ABS	Module absent
7	RS	Rate select
8	RX_LOS	Receiver loss of signal indication
9	VeeR	Module receiver ground
10	VeeR	Module receiver ground
11	VeeR	Module receiver ground
12	RD-	Receiver inverted data output
13	RD+	Receiver noninverted data output
14	VeeR	Module receiver ground
15	VccR	Module receiver 3.3 V supply
16	VccT	Module transmitter 3.3 V supply
17	VeeT	Module transmitter ground
18	TD+	Transmitter noninverted data input
19	TD-	Transmitter inverted data input
20	VeeT	Module transmitter ground

Table 72: SFP+ Network Port Connector Pinout Information

Pin	Signal	Description
1	VeeT	Module transmitter ground
2	TX_Fault	Module transmitter fault
3	TX_Disable	Transmitter disabled
4	SDA	2-wire serial interface data line
5	SCL-	2-wire serial interface clock
6	MOD_ABS	Module absent
7	RS0	Rate select 0, optionally controls SFP+ module receiver
8	RX_LOS	Receiver loss of signal indication
9	RS1	Rate select 1, optionally controls SFP+ transmitter
10	VeeR	Module receiver ground
11	VeeR	Module receiver ground
12	RD-	Receiver inverted data output
13	RD+	Receiver noninverted data output
14	VeeR	Module receiver ground
15	VccR	Module receiver 3.3-V supply

Table 72: SFP+ Network Port Connector Pinout Information *(Continued)*

Pin	Signal	Description
16	VccT	Module transmitter 3.3-V supply
17	VeeT	Module transmitter ground
18	TD+	Transmitter noninverted data input
19	TD-	Transmitter inverted data input
20	VeeT	Module transmitter ground

Table 73: QSFP+ and QSFP28 Network Port Connector Pinout Information

Pin	Signal
1	GND
2	TX2n
3	TX2p
4	GND
5	TX4n
6	TX4p
7	GND
8	ModSelL
9	LPMode_Reset

Table 73: QSFP+ and QSFP28 Network Port Connector Pinout Information *(Continued)*

Pin	Signal
10	VccRx
11	SCL
12	SDA
13	GND
14	RX3p
15	RX3n
16	GND
17	RX1p
18	RX1n
19	GND
20	GND
21	RX2n
22	RX2p
23	GND
24	RX4n

Table 73: QSFP+ and QSFP28 Network Port Connector Pinout Information *(Continued)*

Pin	Signal
25	RX4p
26	GND
27	ModPrsL
28	IntL
29	VccTx
30	Vcc1
31	Reserved
32	GND
33	TX3p
34	TX3n
35	GND
36	TX1p
37	TX1n
38	GND

Overview of EX Series Switches: Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

To determine the power budget and power margin needed for fiber-optic connections, you need to understand how signal loss, attenuation, and dispersion affect transmission. EX Series switches use various types of network cables, including multimode and single-mode fiber-optic cable.

Signal Loss in Multimode and Single-Mode Fiber-Optic Cable

Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. However, LEDs are not coherent light sources. They spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. When light traveling in the fiber core radiates into the fiber), higher-order mode loss (HOL) occurs. (Cladding consists of layers of lower-refractive index material in close contact with a core material of higher refractive index.) Together, these factors reduce the transmission distance of multimode fiber compared to that of single-mode fiber.

Single-mode fiber is so small in diameter that rays of light reflect internally through one layer only. Interfaces with single-mode optics use lasers as light sources. Lasers generate a single wavelength of light, which travels in a straight line through the single-mode fiber. Compared to multimode fiber, single-mode fiber has a higher bandwidth and can carry signals for longer distances. Single-mode fiber is consequently more expensive than multimode fiber.

Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

Attenuation and Dispersion in Fiber-Optic Cable

An optical data link functions correctly provided that modulated light reaching the receiver has enough power to be demodulated correctly. *Attenuation* is the reduction in strength of the light signal during transmission. Passive media components such as cables, cable splices, and connectors cause attenuation. Although attenuation is significantly lower for optical fiber than for other media, it still

occurs in both multimode and single-mode transmissions. An efficient optical data link must transmit enough light to overcome attenuation.

Dispersion is the spreading of the signal over time. The following two types of dispersion can affect signal transmission through an optical data link:

- Chromatic dispersion, which is the spreading of the signal over time caused by the different speeds of light rays
- Modal dispersion, which is the spreading of the signal over time caused by the different propagation modes in the fiber

For multimode transmission, modal dispersion usually limits the maximum bit rate and link length. Chromatic dispersion or attenuation is not a factor.

For single-mode transmission, modal dispersion is not a factor. However, at higher bit rates and over longer distances, chromatic dispersion limits the maximum link length.

An efficient optical data link must have enough light to exceed the minimum power that the receiver requires to operate within its specifications. In addition, the total dispersion must be within the limits specified for the type of link in Telcordia Technologies document GR-253-CORE (Section 4.3) and International Telecommunications Union (ITU) document G.957.

When chromatic dispersion is at the maximum allowed, you can consider its effect as a power penalty in the power budget. The optical power budget must allow for the sum of component attenuation, power penalties (including those from dispersion), and a safety margin for unexpected power loss.

Calculate the Fiber-Optic Cable Power Budget for EX Series Devices

To ensure that fiber-optic connections have sufficient power for correct operation, calculate the link's power budget when planning fiber-optic cable layout and distances. This planning helps you ensure that fiber-optic connections have sufficient power for correct operation. The power budget is the maximum amount of power the link can transmit. When you calculate the power budget, you use a worst-case analysis to provide a margin of error. You use a worst-case analysis even though not all the parts of an actual system operate at the worst-case levels.

To calculate the worst-case estimate for a fiber-optic cable power budget (P_B) for the link:

1. Determine values for the link's minimum transmitter power (P_T) and minimum receiver sensitivity (P_R). In the following example, we measure both (P_T) and (P_R) in decibels relative to one milliwatt (dBm).

   P_T = – 15 dBm

   P_R = – 28 dBm

NOTE: See the specifications for your transmitter and receiver to find the minimum transmitter power and minimum receiver sensitivity.

2. Calculate the power budget (P_B) by subtracting (P_R) from (P_T):

   – 15 dBm – (–28 dBm) = 13 dBm

Calculating the Fiber-Optic Cable Power Margin for EX Series Devices

Before calculating the power margin, calculate the power budget (see *Calculating the Fiber-Optic Cable Power Budget for EX Series Devices*).

Calculate the link's power margin when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient signal power to overcome system loss and still satisfy the minimum input requirements of the receiver for the required performance level. The power margin (P_M) is the amount of power available after you subtract attenuation or link loss (LL) from the power budget (P_B).

When you calculate the power margin, you use a worst-case analysis to provide a margin of error, even though not all parts of an actual system operate at worst-case levels. A power margin (P_M) greater than zero indicates that the power budget is sufficient to operate the receiver and that it does not exceed the maximum receiver input power. This means that the link will work. A (P_M) that is zero or negative indicates insufficient power to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

To calculate the worst-case estimate for the power margin (P_M) for the link:

1. Determine the maximum value for link loss (LL) by adding estimated values for applicable link-loss factors—for example, use the sample values for various factors as provided in Table 74 on page 134 (here, the link is 2 km long and multimode, and the (P_B) is 13 dBm):

   Table 74: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link-Loss Value	Sample (LL) Calculation Values
Higher-order mode losses (HOL)	• Multimode—0.5 dBm • Single mode—None	• 0.5 dBm • 0 dBm

Table 74: Estimated Values for Factors Causing Link Loss *(Continued)*

Link-Loss Factor	Estimated Link-Loss Value	Sample (LL) Calculation Values
Modal and chromatic dispersion	• Multimode—None, if product of bandwidth and distance is less than 500 MHz/km • Single mode—None	• 0 dBm • 0 dBm
Connector	0.5 dBm	This example assumes 5 connectors. Loss for 5 connectors: (5) * (0.5 dBm) = 2.5 dBm
Splice	0.5 dBm	This example assumes 2 splices. Loss for two splices: (2) * (0.5 dBm) = 1 dBm
Fiber attenuation	• Multimode—1 dBm/km • Single mode—0.5 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: • (2 km) * (1.0 dBm/km) = 2 dBm • (2 km) * (0.5 dBm/km) = 1 dBm
Clock Recovery Module (CRM)	1 dBm	1 dBm

NOTE: For information about the actual amount of signal loss caused by equipment and other factors, see your vendor documentation for that equipment.

2. Calculate the (P_M) by subtracting (LL) from (P_B):

   $P_B - LL = P_M$

   (13 dBm) – (0.5 dBm [HOL]) – ((5) * (0.5 dBm)) – ((2) * (0.5 dBm)) – ((2 km) * (1.0 dBm/km)) – (1 dB [CRM]) = P_M

   13 dBm – 0.5 dBm – 2.5 dBm – 1 dBm – 2 dBm – 1 dBm = P_M

   P_M = 6 dBm

The calculated power margin is greater than zero, indicating that the link has sufficient power for transmission. Also, the power margin value does not exceed the maximum receiver input power. Refer to the specification for your receiver to find the maximum receiver input power.

EX4400 Management Cable Specifications and Pinouts

IN THIS SECTION

Management Cable Specifications

Table 75 on page 136 lists the specifications for the cables that connect the console and management ports to management devices.

Table 75: Specifications of Cables to Connect to Management Devices

Ports	Cable Specifications	Receptacle	Additional Information
RJ-45 Console port	Rollover cable	RJ-45	*Connect a Device to a Management Console Using an RJ-45 Connector*
Management Ethernet port	Ethernet cable with an RJ-45 connector	RJ-45	*Connect a Device to a Network for Out-of-Band Management*

Table 75: Specifications of Cables to Connect to Management Devices *(Continued)*

Ports	Cable Specifications	Receptacle	Additional Information
Mini-USB Type-B Console port	Mini-USB cable with standard-A and Mini-USB Type-B (5-pin) connector	Mini-USB	

Console Port Connector Pinout Information

The console port on a Juniper Networks device is an RS-232 serial interface that uses an RJ-45 connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

Table 76 on page 137 provides the pinout information for the RJ-45 console connector.

NOTE: If your laptop or desktop PC does not have a DB-9 plug connector pin and you want to connect your laptop or desktop PC directly to a device, use a combination of the RJ-45-to-DB-9 socket adapter and a USB-to-DB-9 plug adapter. You must provide the USB-to-DB-9 plug adapter.

NOTE: We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

Table 76: Console Port Connector Pinout Information

Pin	Signal	Description
1	NC	No connect
2	NC	No connect

Table 76: Console Port Connector Pinout Information *(Continued)*

Pin	Signal	Description
3	TxD Output	Transmit data
4	GND	Signal ground
5	GND	Signal ground
6	RxD Input	Receive data
7	DCD Input	Data carrier detect
8	NC	No connect

USB Port Specifications for an EX Series Switch

Juniper Networks tested and officially supports the following USB flash drives for the USB port on all EX Series switches:

- RE-USB-1G-S
- RE-USB-2G-S
- RE-USB-4G-S

CAUTION: Any USB memory product not listed as supported for EX Series switches has not been tested by Juniper Networks. The use of any unsupported USB memory product could expose your EX Series switch to unpredictable behavior. Juniper Networks Technical Assistance Center (JTAC) can provide only limited support for issues related to unsupported hardware. We strongly recommend that you use only supported USB flash drives.

All USB flash drives used on EX Series switches must have the following features:

- USB 2.0 or later.

- Formatted with a FAT or MS-DOS file system.
- If the switch is running Junos OS Release 9.5 or earlier, the formatting method must use a primary boot record. Microsoft Windows formatting, by default, does not use a primary boot record. See the documentation for your USB flash drive for information about how your USB flash drive is formatted.

RJ-45 Management Port Connector Pinout Information

Table 77 on page 139 provides the pinout information for the RJ-45 connector for the management port on Juniper Networks devices.

Table 77: RJ-45 Management Port Connector Pinout Information

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1
2	TRP1-	Transmit/receive data pair 1
3	TRP2+	Transmit/receive data pair 2
4	TRP3+	Transmit/receive data pair 3
5	TRP3-	Transmit/receive data pair 3
6	TRP2-	Transmit/receive data pair 2
7	TRP4+	Transmit/receive data pair 4
8	TRP4-	Transmit/receive data pair 4

RJ-45 to DB-9 Serial Port Adapter Pinout Information

The console port on a Juniper Networks device is an RS-232 serial interface that uses an RJ-45 connector to connect to a management device such as a laptop or a desktop PC. If your laptop or desktop PC does not have a DB-9 plug connector pin and you want to connect your laptop or desktop PC to the device, use a combination of the RJ-45 to DB-9 socket adapter along with a USB to DB-9 plug adapter.

Table 78 on page 140 provides the pinout information for the RJ-45 to DB-9 serial port adapter.

Table 78: RJ-45 to DB-9 Serial Port Adapter Pinout Information

RJ-45 pin	Signal	DB-9 pin	Signal
1	NC	8	CTS
2	NC	6	DSR
3	TxD	2	RxD
4	GND	5	GND
6	RxD	3	TxD
7	DCD	4	DTR
8	NC	7	RTS

4

CHAPTER

Installation and Configuration

Install the EX4400 Switch

SUMMARY

This topic guides you through the steps to install EX4400 switches on two post racks, four-post racks, desks, and walls.

IN THIS SECTION

Unpack an EX4400 Switch

We ship EX4400 switches in a cardboard carton, secured with foam packing material. The carton has an accessory compartment.

CAUTION: EX4400 switches are maximally protected inside the shipping carton. Do not unpack the switches until you are ready to mount the switch.

To unpack the switch:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Pull out the packing material holding the switch in place.

5. Verify the parts received against the inventory on the label attached to the carton (see "Packing List for an EX4400 Switch" on page 143).
6. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Packing List for an EX4400 Switch

The switch shipment includes a packing list. Check the parts you receive with the switch against the items on the packing list. The parts shipped depend on the switch model you purchase (see "EX4400 Models and Specifications" on page 16).

If any part on the packing list is missing, contact your customer service representative or contact Juniper customer care from within the U.S. or Canada by telephone at 1-888-314-5822. For international-dial or direct-dial options in countries without toll-free numbers, see https://www.juniper.net/support/requesting-support.html.

Table 79 on page 143 lists the parts and their quantities as listed in the standard packing list for an EX4400 switch.

Table 79: Inventory of Components Provided with an EX4400 Switch

Component	Quantity
Switch	1
Fan modules	2 preinstalled
Power supply	1 (AC or DC) preinstalled
(If you purchased a model with an AC power supply) AC power cord appropriate for your geographical location	1
(If you purchased a model with an AC power supply) AC power cord retainer	1
Covers for slots without preinstalled components	• Extension module slot cover panel: 1 • Power supply slot cover panel: 1

Table 79: Inventory of Components Provided with an EX4400 Switch *(Continued)*

Component	Quantity
Two-post mounting brackets	2
Screws to attach the mounting brackets	8
Rubber feet to mount the switch on a desktop or other level surface	4
Documentation Roadmap	1
Juniper Networks Product Warranty	1
End User License Agreement	1

Register Products—Mandatory to Validate SLAs

Register all new Juniper Networks hardware products and changes to an existing installed product using the Juniper Networks website to activate your hardware replacement service-level agreements (SLAs).

CAUTION: Register product serial numbers on the Juniper Networks website. Update the installation base data if any addition or change to the installation base occurs or if the installation base is moved. Juniper Networks is not responsible for not meeting the hardware replacement service-level agreement for products that do not have registered serial numbers or accurate installation base data.

Register your product(s) at https://tools.juniper.net/svcreg/SRegSerialNum.jsp.
Update your installation base at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp.

Mount an EX4400 Switch on Two Posts of a Rack

You can mount an EX4400 switch on a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting kit (part number: EX-RMK) provided with the switch. (The remainder of this topic uses *rack* to mean rack or cabinet.)

Before you mount an EX4400 switch on two posts of a rack:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4400 Switches" on page 114 .
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure the rack to the building structure.
- Read Juniper Networks Safety Guide, with particular attention to Chassis and Component Lifting Guidelines.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see Prevention of Electrostatic Discharge Damage).
- Remove the switch from the shipping carton (see "Unpack an EX4400 Switch" on page 142).

Ensure that you have the following parts and tools available:

- Number 2 Phillips (+) screwdriver—not provided
- Four screws to secure the mounting brackets to the rack—not provided
- An ESD grounding strap—not provided
- The two-post mounting kit that includes two mounting brackets and eight screws to attach the mounting brackets—provided with the switch
- Covers for the empty extension module slot and the empty power supply slot—provided with the switch

You can also mount an EX4400 switch:

- Flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit.
- In a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit.
- On a desk or other level surface by using the rubber feet provided with the switch.
- On a wall by using a separately orderable wall mount kit.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

NOTE: One person must be available to lift the switch while another person secures the switch to the rack.

CAUTION: If you are mounting multiple units on a rack, mount the heaviest unit at the bottom of the rack, and then mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount an EX4400 switch on two posts of a rack:

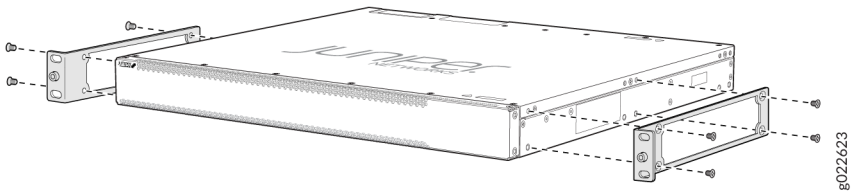
1. Place the switch on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Attach the two-post mounting brackets (provided with the switch) to the side panels of the switch chassis by using the screws to attach the brackets (provided with the switch).

   To mount the switch flush with the posts:

   a. Align the L-shaped (front) end of the mounting brackets flush with the front panel of the switch chassis.

   b. Insert the screws into the aligned holes on the chassis (see No Link Title). Tighten the screws.

Figure 84: Attach the Two-Post Mounting Brackets Flush with the Front Panel of the Switch

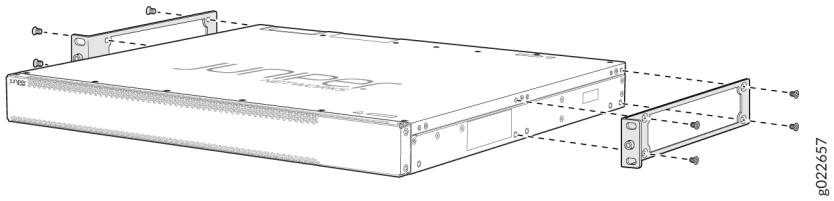


To mount the switch along the middle of its side panels:

a. Align the L-shaped (front) end of the mounting brackets along the middle of the side panels.

b. Insert the screws into the aligned holes on the chassis (see No Link Title). Tighten the screws.

Figure 85: Attach the Two-Post Mounting Brackets Center Aligned to the Side Panels



4. Decide which end of the switch you want to place at the front of the rack. Position the switch so that the **AIR IN** labels on the fan modules are next to the cold aisle and the **AIR OUT** labels on the fan modules are next to the hot aisle.
5. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the holes of the mounting brackets with the threaded holes in the front post of the rack. Align the bottom hole in both the mounting brackets with a hole in each rack rail, making sure that the chassis is level.
6. Have a second person secure the mounting brackets to the rack by using four screws appropriate for your rack. Tighten the screws (see No Link Title or No Link Title).

Figure 86: Secure the Switch Flush with the Posts of the Rack

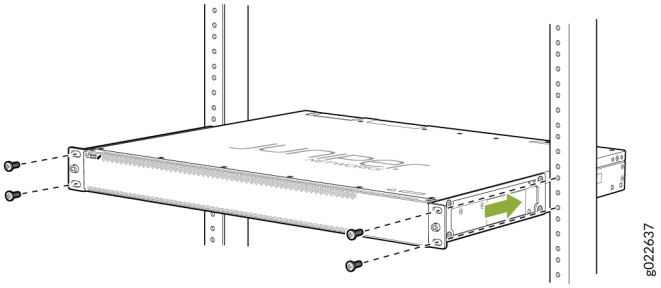
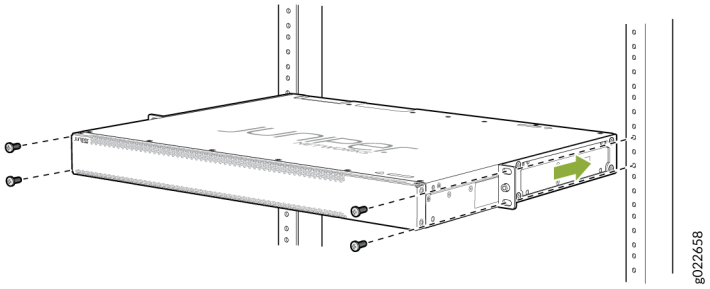


Figure 87: Secure the Switch to the Rack Center Aligned to the Side Panels



7. Ensure that the switch chassis is level by verifying that all screws on one side of the rack align with the screws on the other side.
8. Cover the empty extension module slot and empty power supply slot by using the covers that came with the switch.

NOTE: The slot covers reduce the risk of objects or substances entering the chassis. They also ensure optimal cooling for the switch.

Mount an EX4400 Switch Flush with the Front Posts of a Four-Post Rack or Cabinet

You can mount an EX4400 switch flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit (part number: EX-4PST-RMK). (The remainder of this topic uses *rack* to mean rack or cabinet.)

Before you mount an EX4400 switch flush with the front posts of a 19-in. four-post rack:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4400 Switches" on page 114 .
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure the rack to the building structure.
- Read Juniper Networks Safety Guide, with particular attention to Chassis and Component Lifting Guidelines.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see Prevention of Electrostatic Discharge Damage).
- Remove the switch from the shipping carton (see "Unpack an EX4400 Switch" on page 142).

Ensure that you have the following parts and tools available:

- Number 2 Phillips (+) screwdriver—not provided
- Eight screws to secure the mounting brackets to the rack—not provided
- An ESD grounding strap—not provided
- Front mounting bracket assembly to mount the switch flush with the front posts of a rack—2 (provided with the four-post rack mount kit)

The front mounting bracket assembly is made up of a side rail to which an L-shaped bracket is attached.

- Flat head 4x6-mm Phillips screws to attach the front mounting bracket assembly to the chassis—12 (provided with the four-post rack mount kit)
- Rear mounting brackets—2 (provided with the four-post rack mount kit)
- Covers for the empty extension module slot and the empty power supply slot—provided with the switch

You can also mount an EX4400 switch:

- In a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit.
- On a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting brackets and screws provided with the switch.
- On a desk or other level surface by using the rubber feet provided with the switch.
- On a wall by using a separately orderable wall mount kit.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

NOTE: One person must be available to lift the switch while another person secures the switch to the rack.

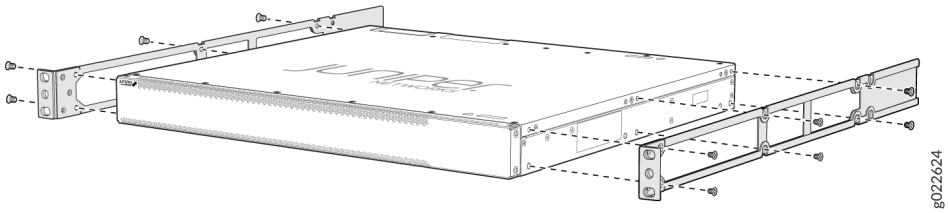
CAUTION: If you are mounting multiple units on a rack, mount the heaviest unit at the bottom of the rack, and then mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount an EX4400 switch flush with the front posts of a 19-in. four-post rack:

1. Place the switch on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Align the front mounting bracket assembly (provided with the four-post rack mount kit) along the side panel of the switch such that the front of the bracket assembly is flush with the front panel of the switch chassis.

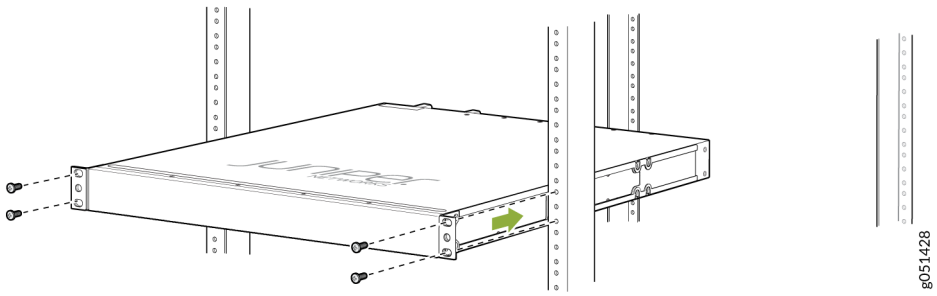
4. Insert the flat head 4x6-mm Phillips screws to attach the front mounting bracket assembly (provided with the four-post rack mount kit) into the aligned holes on the chassis (see Figure 88 on page 150). Tighten the screws.

Figure 88: Attach the Flush Mounting Bracket Assembly to the Switch



5. Decide which end of the switch you want to place at the front of the rack. Position the switch so that the **AIR IN** labels on the fan modules are next to the cold aisle and the **AIR OUT** labels on the fan modules are next to the hot aisle.
6. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the holes of the mounting brackets with the threaded holes in the front post of the rack. Align the bottom hole in both the mounting brackets with a hole in each rack rail, making sure that the chassis is level.
7. Have a second person secure the mounting brackets to the rack by using the screws appropriate for your rack. Tighten the screws (see Figure 89 on page 150).

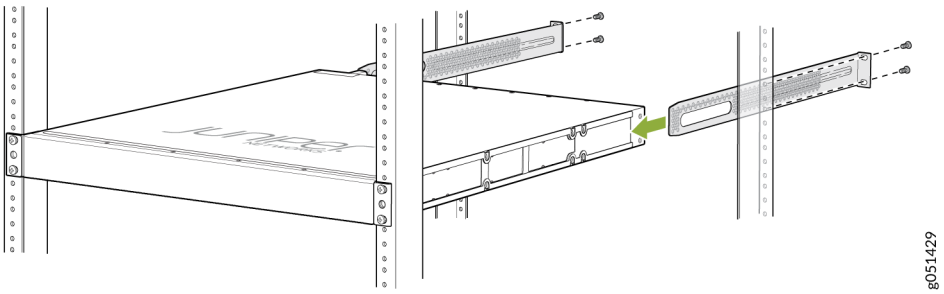
Figure 89: Secure the Switch to the Front Posts of a Rack



8. Slide the rear mounting bracket blades into the side rails of the front mounting bracket assembly attached to the switch chassis (see Figure 90 on page 151).
9. Ensure that the chassis is level. Align the holes of the rear mounting brackets with the threaded holes in the rear post of the rack. Align the bottom hole in both the mounting brackets with a hole in each rack rail. Align the bottom hole in both the rear mounting brackets with the bottom hole in the front mounting brackets.

10. Secure the rear mounting brackets to the rear post of the rack by using four screws appropriate for your rack (see Figure 90 on page 151).

Figure 90: Secure the Switch to the Rear Post of the Rack by Using the Rear Mounting Brackets



11. Cover the empty extension module slot and empty power supply slot by using the covers that came with the switch.

NOTE: The slot covers reduce the risk of objects or substances entering the chassis. They also ensure optimal cooling for the switch.

Mount an EX4400 Switch in a Recessed Position in a Rack or Cabinet

You can mount an EX4400 switch in a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit (part number: EX-4PST-RMK). (The remainder of this topic uses *rack* to mean rack or cabinet.)

Before you mount an EX4400 switch in a recessed position inside a 19-in. four-post rack:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4400 Switches" on page 114 .
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure the rack to the building structure.
- Read Juniper Networks Safety Guide, with particular attention to Chassis and Component Lifting Guidelines.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see Prevention of Electrostatic Discharge Damage).
- Remove the switch from the shipping carton (see "Unpack an EX4400 Switch" on page 142).

Ensure that you have the following parts and tools available:

- Number 2 Phillips (+) screwdriver—not provided
- Eight screws to secure the mounting brackets to the rack—not provided
- An ESD grounding strap—not provided
- Front mounting bracket assembly to mount the switch flush with the front posts of a rack—2 (provided with the four-post rack mount kit)

  The front mounting bracket assembly is made up of a side rail to which an L-shaped bracket is attached.
- Flat head 4x6-mm Phillips screws to attach the front mounting bracket assembly to the chassis—12 (provided with the four-post rack mount kit)
- Rear mounting brackets with blades—2 (provided with the four-post rack mount kit)
- Recessed-mounting brackets to mount the switch in a recessed position from the front posts of a rack—2 (provided with the four-post rack mount kit)
- Flat head 4-40 Phillips screws to attach the recessed-mounting brackets to the side rails of the bracket assembly—6 (provided with the four-post rack mount kit)
- Covers for the empty extension module slot and the empty power supply slot—provided with the switch

You can also mount an EX4400 switch:

- Flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit.
- On a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting brackets and screws provided with the switch.
- On a desk or other level surface by using the rubber feet provided with the switch.
- On a wall by using a separately orderable wall mount kit.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

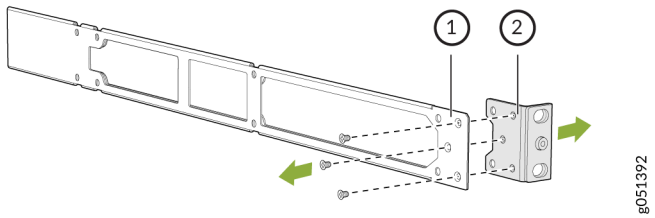
NOTE: One person must be available to lift the switch while another person secures the switch to the rack.

CAUTION: If you are mounting multiple units on a rack, mount the heaviest unit at the bottom of the rack, and then mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount an EX4400 switch in a recessed position from the front posts of a 19-in. four-post rack:

1. Place the switch on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Unscrew and detach the L-shaped bracket from the side rail in the front mounting bracket assembly provided with the four-post rack mount kit (see Figure 91 on page 153).

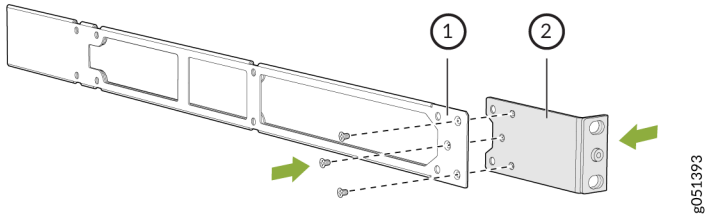
Figure 91: Unscrew and Detach the L-Shaped Bracket from the Side Rail



1– Side rail	2– L-shaped bracket

4. Attach the recessed-mounting brackets provided with the four-post rack mount kit to the side rails by using the flat head 4-40 Phillips screws provided with the four-post rack mount kit (see Figure 92 on page 153).

Figure 92: Attach the Recessed-Mounting Bracket to the Side Rail

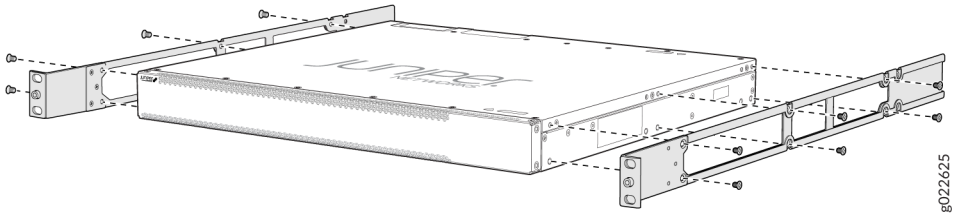


1– Side rail	2– Recessed mounting bracket

5. Align the recessed-mounting bracket assembly along the side panel of the switch.

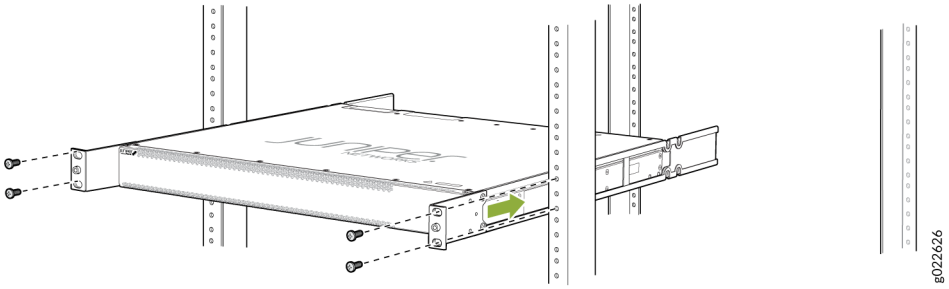
6. Insert the flat head 4x6-mm Phillips screws to attach the recessed-mounting bracket assembly into the aligned holes on the chassis provided with the four-post rack mount kit (see Figure 93 on page 154). Tighten the screws.

Figure 93: Attach the Recessed-Mounting Bracket Assembly to the Switch



7. Decide which end of the switch you want to place at the front of the rack. Position the switch so that the **AIR IN** labels on the fan modules are next to the cold aisle and the **AIR OUT** labels on the fan modules are next to the hot aisle.
8. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the holes of the mounting brackets with the threaded holes in the front post of the rack. Align the bottom hole in both the mounting brackets with a hole in each rack rail, making sure that the chassis is level.
9. Have a second person secure the mounting brackets to the rack by using four screws appropriate for your rack. Tighten the screws (see Figure 94 on page 154).

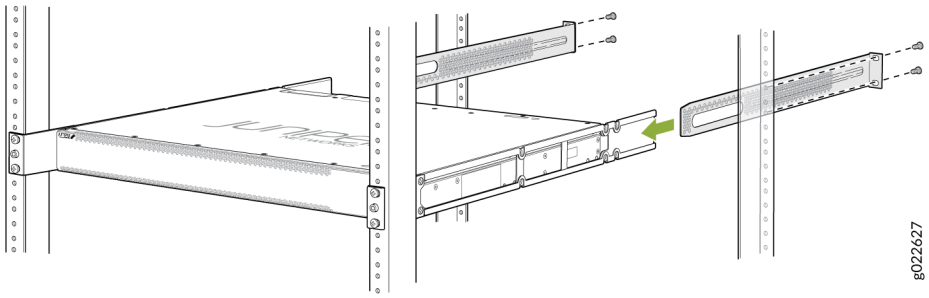
Figure 94: Secure the Switch to the Front Posts of a Rack



10. Slide the rear mounting bracket blades into the side rails of the recessed-mounting bracket assembly attached to the switch chassis (see Figure 95 on page 155).
11. Ensure that the chassis is level. Align the holes of the rear mounting brackets with the threaded holes in the rear post of the rack. Align the bottom hole in both the mounting brackets with a hole in each rack rail. Align the bottom hole in both the rear mounting brackets with the bottom hole in the front mounting brackets.

12. Secure the rear mounting brackets to the rear post of the rack by using four screws appropriate for your rack (see Figure 95 on page 155).

Figure 95: Secure the Switch to the Rear Post of the Rack by Using the Rear Mounting Brackets



13. Cover the empty extension module slot and empty power supply slot by using the covers that came with the switch.

NOTE: The slot covers reduce the risk of objects or substances entering the chassis. They also ensure optimal cooling for the switch.

Mount an EX4400 Switch on a Desk or Other Level Surface

You can mount an EX4400 switch on a desk or other level surface by using the four rubber feet that are provided with the switch. The rubber feet stabilize the chassis.

Before you mount an EX4400 switch on a desk or other level surface:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4400 Switches" on page 114 .
- Place the desk in its permanent location, allowing adequate clearance for airflow and maintenance, and secure the desk to the building structure.
- Read Juniper Networks Safety Guide, with particular attention to Chassis and Component Lifting Guidelines.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see Prevention of Electrostatic Discharge Damage).
- Remove the switch from the shipping carton (see "Unpack an EX4400 Switch" on page 142).

Ensure that you have the following parts and tools available:

- Four rubber feet to stabilize the chassis on the desk or other level surface—provided with the switch
- Covers for the empty extension module slot and the empty power supply slot—provided with the switch

You can also mount an EX4400 switch:

- Flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit.
- In a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit.
- On a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting brackets provided with the switch.
- On a wall by using a separately orderable wall mount kit.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

To mount the EX4400 on a desk or other level surface:

1. Turn the chassis upside down on the desk or the level surface where you intend to mount the switch.
2. Remove the sticker from the rubber feet.
3. Attach the rubber feet to the bottom of the chassis.
4. Turn the chassis right side up on the desk or the level surface.
5. Cover the empty extension module slot and empty power supply slot by using the covers that came with the switch.

NOTE: The slot covers reduce the risk of objects or substances entering the chassis. They also ensure optimal cooling for the switch.

Mount an EX4400 Switch on a Wall

You can mount an EX4400 switch on a wall by using a separately orderable wall mount kit (part number: EX-WMK). (The remainder of this topic uses *rack* to mean rack or cabinet.)

Before mounting the switch on a wall:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4400 Switches" on page 114 .
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure the rack to the building structure.
- Read *General Safety Guidelines and Warnings*, with particular attention to *Chassis and Component Lifting Guidelines*.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Remove the switch from the shipping carton (see "Unpack an EX4400 Switch" on page 142).

Ensure that you have the following parts and tools available:

- Number 2 Phillips (+) screwdriver—not provided
- 8-32 x 1.25 in. or M4 x 30 mm mounting screws— 4 (not provided)
- Hollow wall anchors capable of supporting the combined weight of four fully loaded switches, up to 66 lb (30 kg) (not provided), if you are mounting the switch in sheetrock (wall board with a gypsum plaster core) or in wall board not backed by wall studs.
- Wall mount brackets—2 (provided with the wall mount kit)
- Wall mount bracket screws—12 (provided with the wall mount kit)
- Covers for the empty extension module slot and the empty power supply slot—provided with the switch
- An ESD grounding strap—not provided

WARNING: When you are mounting EX4400 switches on a wall, orient the front panel of the chassis pointing to the right side or to the left side to ensure proper airflow and meet safety requirements in the event of a fire.

NOTE: For easier lifting, install any additional power supplies only after you mount the switch on the wall.

You can also mount an EX4400 switch:

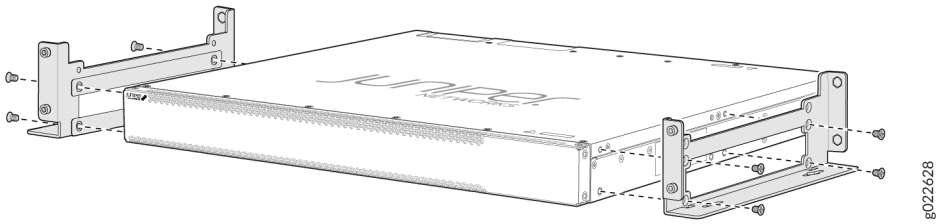
- Flush with the front posts of a 19-in. four-post rack by using a separately orderable four-post rack mount kit.

- In a recessed position inside a 19-in. four-post rack by using the recessed-mounting brackets provided with a separately orderable four-post rack mount kit.
- On a two-post rack or on two posts of a 19-in. four-post rack by using the two-post mounting brackets and screws provided with the switch.
- On a desk or other level surface by using the rubber feet provided with the switch.

To know the part numbers for ordering the separately orderable mounting kits, see the EX4400 Switches Datasheet.

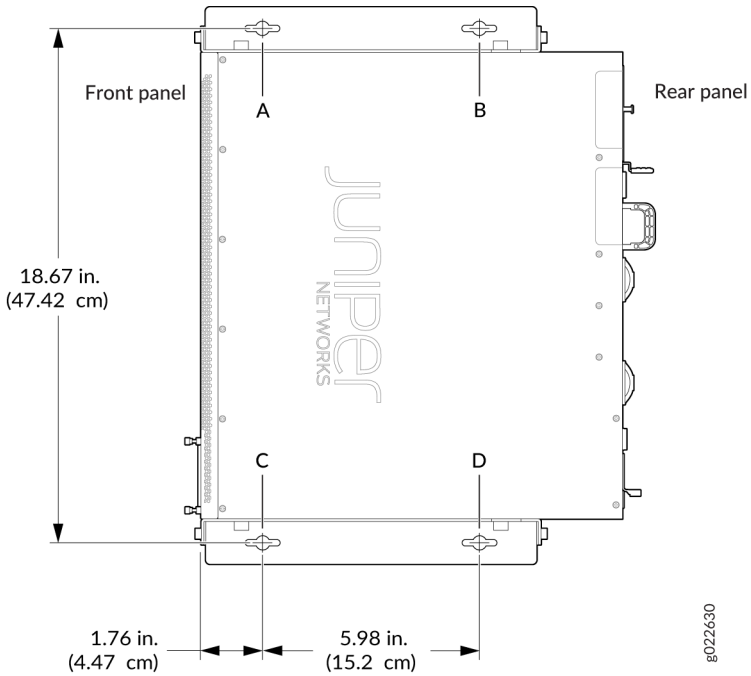
1. Place the switch on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Attach the wall mount brackets to the sides of the chassis by using four of the wall mount bracket screws on each side (see Figure 96 on page 158). Use the screwdriver to tighten the screws.

Figure 96: Attach Wall Mount Brackets to the Switch



4. Insert the four mounting screws in the wall. Insert the top pair of mounting screws 15.2 cm apart, and insert the second pair of mounting screw 47.42 cm directly below the first pair (see Figure 97 on page 159).

Figure 97: Measurements for Mounting an EX4400 Switch on a Wall

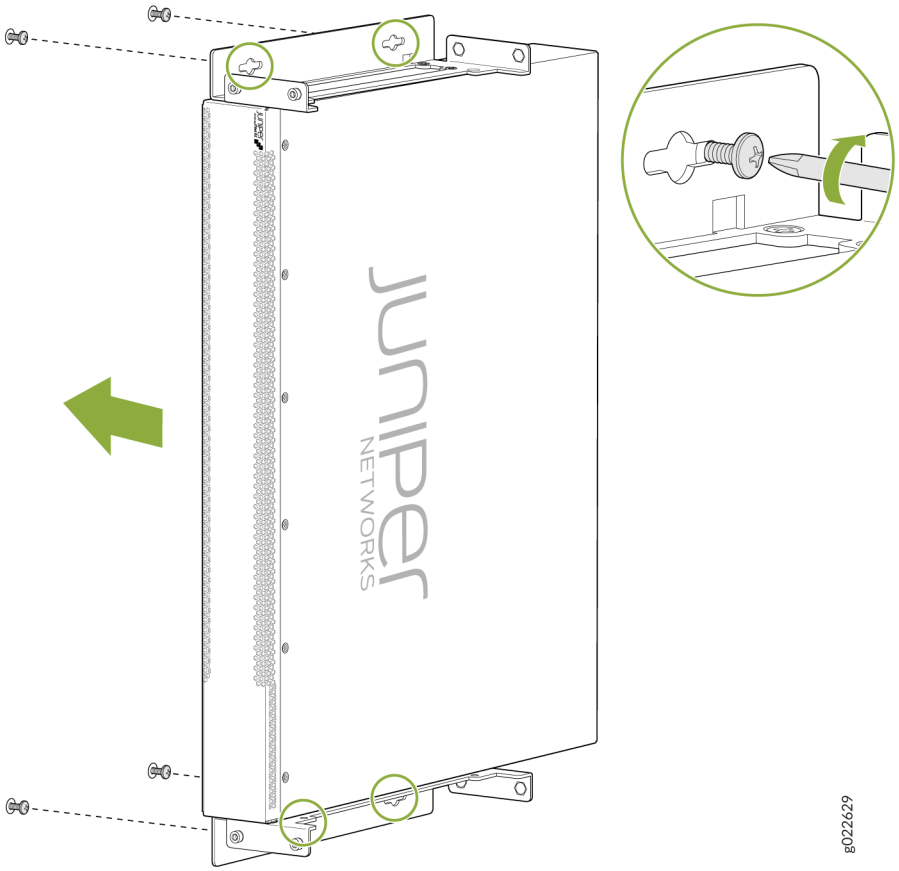


If the mounting screws are inserted in a wall board with no stud behind it, you must use dry wall anchors rated to support 66 lb (30 kg). Insert the screws into wall studs wherever possible to provide added support for the chassis.

Drive the screws only part way in, leaving about 1/4 in. (6 mm) distance between the head of the screw and the wall. Use the screwdriver to drive the screws in.

5. Grasp each side of the switch, lift the switch, and hang the brackets from the mounting screws (see Figure 98 on page 160).

Figure 98: Mount the Switch on a Wall



6. Tighten the mounting screws by using the screwdriver.
7. Cover the empty extension module slot and empty power supply slot by using the covers that came with the switch.

NOTE: The slot covers reduce the risk of objects or substances entering the chassis. The covers also ensure optimal cooling for the switch.

Connect the EX4400 to Power

IN THIS SECTION

Connect Earth Ground to an EX4400 Switch

To ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements, you must connect the EX4400 switch to earth ground before you connect power to the switch. You must use the protective earthing terminal on the switch chassis to connect the switch to earth ground (see Figure 99 on page 163).

You must install the EX4400 switch in a restricted-access location and ensure that the chassis is always properly grounded. EX4400 switches have a 2-hole protective grounding terminal on the rear panel of the chassis. Under all circumstances, use this grounding connection to ground the chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

CAUTION: Ensure that a licensed electrician has attached the appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the switch.

Before you connect earth ground to a EX4400 switch, ensure that you have the parts and tools listed in Table 80 on page 161 available:

Table 80: Parts Required for Connecting an EX4400 Switch to Earth Ground

Item	Switch Model	Description
Earthing terminal location	All EX4400 switches	Rear panel of the chassis

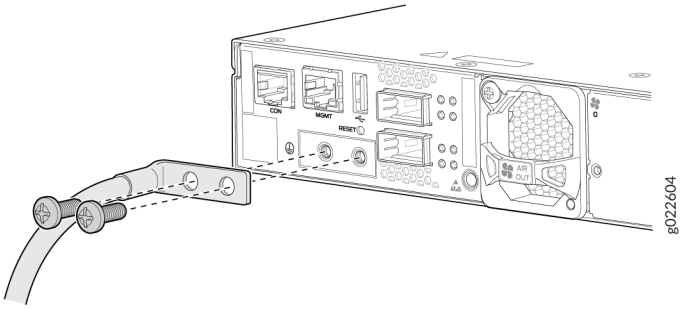
Table 80: Parts Required for Connecting an EX4400 Switch to Earth Ground *(Continued)*

Item	Switch Model	Description
Grounding cable requirements	EX4400 switches shipped before March 2023	14 AWG (1.5 mm^2), minimum 90° C wire, or as permitted by the local code—not provided
	EX4400 switches shipped from March 2023	8 AWG (6 mm^2), minimum 90° C wire, or as permitted by the local code—not provided
Grounding lug specifications	EX4400 switches shipped before March 2023	Panduit LCD10-10AF-L or equivalent—not provided
	EX4400 switches shipped from March 2023	Panduit LCD8-10AF-L or equivalent —not provided
Screws to secure the grounding lug	All EX4400 switches	Two 10-32 x .25 in. screws with #10 split-lock washers—not provided
Tools required	All EX4400 swiches	Number 2 Phillips (+) screwdriver—not provided Electrostatic discharge (ESD) grounding strap—not provided

To ground the EX4400 switch:

1. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the switch is mounted.
2. Place the grounding lug attached to the grounding cable over the protective earthing terminal on the rear panel (see Figure 99 on page 163).

Figure 99: Connect a Grounding Cable to an EX4400 Switch



3. Secure the grounding lug to the protective earthing terminal with the screws.
4. Dress the grounding cable. Be sure that it does not touch or block access to other switch components.

WARNING: Ensure that the cable does not drape where people could trip over it.

Connect AC Power to an EX4400 Switch

Before you connect AC power to the switch:

- Ensure that you have a power cord appropriate for your geographical location available.
- Ensure that you have the power cord retainer shipped with the switch.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have an ESD grounding strap (not provided).
- Ensure that you have connected the switch chassis to earth ground.

CAUTION: Before you connect power to the switch, a licensed electrician must attach a cable lug to the grounding cable that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power (see "Connect Earth Ground to an EX4400 Switch" on page 161).

- Ensure that you provide an external certified circuit breaker (2-pole circuit breaker based on your device current rating) rated minimum 13 A, 16 A, or 20 A in the building installation or as per local electrical code.

We ship the EX4400 switches with one power supply preinstalled on the rear panel. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running: You can remove and replace either one of them without powering off the switch or disrupting switch functions.

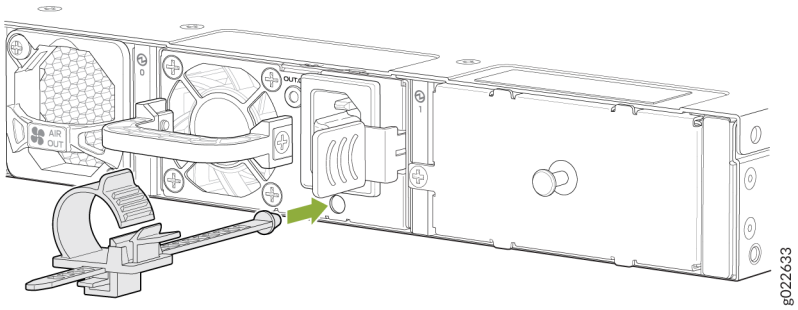
To connect power to an EX4400 switch with an AC power supply:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Ensure that the power supplies are fully inserted in the chassis.
3. Locate the power cord or cords shipped with the switch; the cords have plugs appropriate for your geographical location.

WARNING: Ensure that the power cord does not block access to device components or drape where people can trip on it.

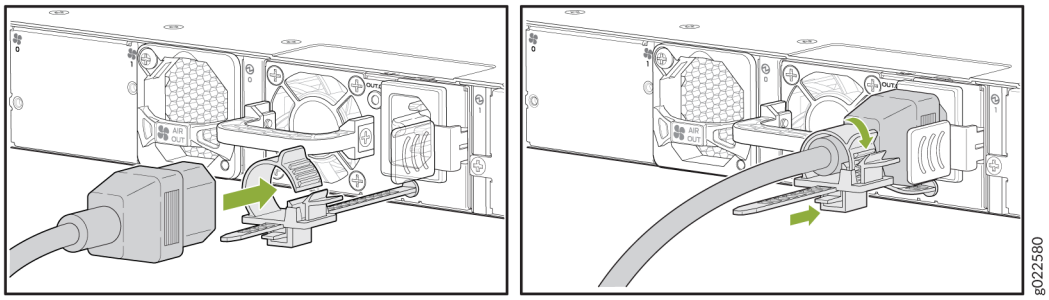
4. Push the end of the retainer strip into the hole below the inlet on the power supply faceplate until it snaps into place. Ensure that the loop in the retainer strip points upward (see Figure 100 on page 164).

Figure 100: Connect Retainer Strip



5. Press the small tab on the retainer strip to loosen the loop. Slide the loop until you have enough space to insert the power cord coupler into the inlet.
6. Insert the power cord coupler firmly into the inlet.
7. Slide the loop toward the power supply until it is snug against the base of the coupler.
8. Press the tab on the loop and draw out the loop into a tight circle (see Figure 101 on page 165).

Figure 101: Connect Power to an EX4400 Switch with an AC Power Supply



9. If the AC power source outlet has a power switch, set it to the off position.
10. Insert the power cord plug into the AC power source outlet. The EX4400 switch powers on as soon as power is provided to the power supply. There is no power switch on the EX4400.
11. If the AC power source outlet has a power switch, set it to the on position.
12. Verify that the **OUT.OK** LED on the power supply is lit steadily green. If it is not, disconnect the power supply from the power source, and replace the power supply (see "Maintain the EX4400 Power System" on page 199).

> ⚠ **CAUTION**: Do not remove the power supply until you have a replacement power supply ready: you must install the replacement power supply within one minute after removing the failed power supply to ensure proper airflow and prevent chassis overheating.

Connect DC Power to an EX4400 Switch

Before you connect DC power to the switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the switch chassis to earth ground.

CAUTION: Before you connect power to the switch, a licensed electrician must attach a cable lug to the grounding cable that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power (see "Connect Earth Ground to an EX4400 Switch" on page 161).

Ensure that you have the following parts and tools available:

- DC power source cord with a connector (CBL-JNP-PWR-DSUB)—provided
- Number 2 Phillips (+) screwdriver—not provided
- An ESD grounding strap—not provided

We ship the EX4400 switches with one power supply preinstalled on the rear panel. You can install up to two power supplies in the switch. You must order the second power supply and a power source cord separately. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can remove and replace either one of the power supplies without powering off the switch or disrupting switch functions.

NOTE: You must connect the battery returns of the DC power supply to frame ground.

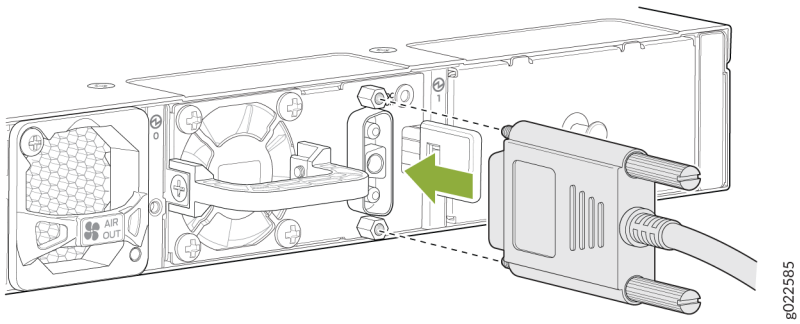
To connect power to an EX4400 switch with a DC power supply:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.

   CAUTION: The connection between each power source and power supply must include a circuit breaker.

2. Ensure that the input circuit breaker is open so that the voltage across the DC power source cord leads is 0 V and that the cord leads do not become active while you are connecting DC power.
3. Ensure that the power supplies are fully inserted in the chassis.
4. Insert the power cord coupler firmly into the inlet and tighten the screws on the coupler by using the screwdriver (see Figure 102 on page 167).

Figure 102: Connect Power to an EX4400 Switch with a DC Power Supply



5. Connect the power cord to the power source. The EX4400 switch powers on as soon as power is provided to the power supply. There is no power switch on the EX4400.

   We've designed the EX4400 switch to operate with a DC power supply that has a single, nonredundant feed input. For source redundancy, you must install two DC power supplies in the EX4400; connect one source to one power supply and connect another source to the second power supply. This configuration provides the commonly deployed feed redundancy for the system.
6. Close the input circuit breaker.
7. Verify that the **DC.OK** LED on the power supply is lit steadily green. If it is not, disconnect the power supply from the power source, and replace the power supply (see "Maintain the EX4400 Power System" on page 199).

> **CAUTION**: Do not remove the power supply until you have a replacement power supply ready: you must install the replacement power supply within one minute after removing the failed power supply to ensure proper airflow and prevent chassis overheating.

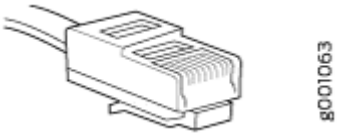
Connect the EX4400 to External Devices

IN THIS SECTION

Connect a Device to a Network for Out-of-Band Management

Ensure that you have an Ethernet cable that has an RJ-45 connector at either end. Figure 103 on page 168 shows the RJ-45 connector of the Ethernet cable.

Figure 103: RJ-45 Connector on an Ethernet Cable

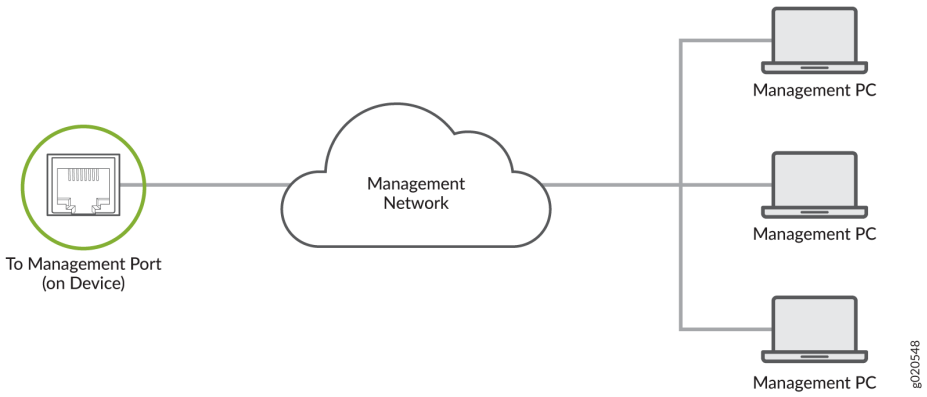


You can monitor and manage these devices by using a dedicated management channel. Each device has a management port to which you can connect an Ethernet cable with an RJ-45 connector. Use the management port to connect the device to the management device.

To connect a device to a network for out-of-band management (see Figure 104 on page 168):

1. Connect one end of the Ethernet cable to the management port on the device.
2. Connect the other end of the Ethernet cable to the management device.

Figure 104: Connect a Device to a Network for Out-of-Band Management

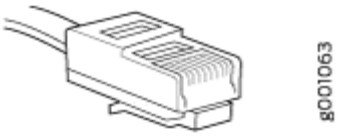


Connect a Device to a Management Console Using an RJ-45 Connector

Ensure that you have an Ethernet cable that has an RJ-45 connector at either end and an RJ-45-to-DB-9 serial port adapter.

Figure 105 on page 169 shows the RJ-45 connector on the Ethernet cable.

Figure 105: RJ-45 Connector on an Ethernet Cable



NOTE: If your laptop or desktop PC does not have a DB-9 plug connector pin and you want to connect your laptop or desktop PC directly to the device, use a combination of the RJ-45-to-DB-9 socket adapter and a USB-to-DB-9 plug adapter. You must provide the USB-to-DB-9 plug adapter.

NOTE: We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

You can configure and manage devices using a dedicated management channel. Each device has a console port that you can connect to using an Ethernet cable with an RJ-45 connector. Use the console port to connect the device to the console server or management console. The console port accepts a cable that has an RJ-45 connector.

To connect the device to a management console (see Figure 106 on page 170 and Figure 107 on page 170):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**, **CONSOLE**, or **CON1**) on the device.
2. Connect the other end of the Ethernet cable to the console server (see Figure 106 on page 170) or management console (see Figure 107 on page 170).

Figure 106: Connect a Device to a Management Console Through a Console Server

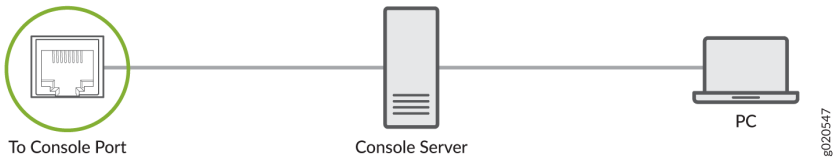


Figure 107: Connect a Device Directly to a Management Console

Connect an EX4400 Switch to a Management Console by Using the USB-C Console Port

Before You Begin

Before you connect the switch by using the USB-C console port:

- Ensure that the USB to serial driver is installed on the host machine.
- Ensure that the HyperTerminal properties of the console server or laptop are set as follows:
  - Baud rate—9600
  - Flow control—None
  - Data—8
  - Parity—None
  - Stop bits—1
  - DCD state—Disregard

You will need:

- One USB cable with USB-C connectors at both ends—not provided.

- (If your laptop or desktop PC does not have a USB-C port) One USB-A to USB-C converter cable—not provided.

EX4400 switches have two console ports:

- An RJ-45 console port on the rear panel that accepts a cable with an RJ-45 connector.
- A USB-C console port on the front panel that accepts a USB cable with a USB-C connector.

You can log in to the switch and configure and manage the switch by using either of the console ports. The RJ-45 console port is enabled by default. However, you must configure the USB-C console port before you can use it to connect to the switch.

In this topic, you learn how to connect EX4400 switches to the management console by using the USB-C console port.

To connect the switch to the console by using the USB-C console port:

1. Connect the host machine to the device directly by using the active console port or remotely by using the management interface.
2. Connect one end of the USB cable to the USB-C or USB-A port your PC or laptop.
3. Connect the other end of the USB cable to the USB-C console port on the front panel switch.
4. Use the `set system ports auxiliary` configuration command to enable logging in to the switch by using the USB-C console port.
5. Use the `request system boot-console auxiliary` command to see the boot logs on the console connected to the USB-C port.
6. Reboot the switch. The boot logs and the login prompt appear on the console connected to the USB-C port.

Connect the EX4400 to the Network

IN THIS SECTION

Install a Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have a rubber safety cap available to cover the transceiver.

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting the device functions.

NOTE: After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only optical transceivers and optical connectors purchased from Juniper Networks with your Juniper Networks device.

CAUTION: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

Figure 108 on page 174 shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To install a transceiver:

CAUTION: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
2. Remove the transceiver from its bag.
3. Check to see whether the transceiver is covered with a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

LASER WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

4. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover and save it in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.
5. Using both hands, carefully place the transceiver in the empty port. The connectors must face the chassis.

CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable.

6. Slide the transceiver in gently until it is fully seated. If you are installing a CFP transceiver, use your fingers to tighten the captive screws on the transceiver.
7. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

LASER WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cable connected to a transceiver emit laser light that can damage your eyes.

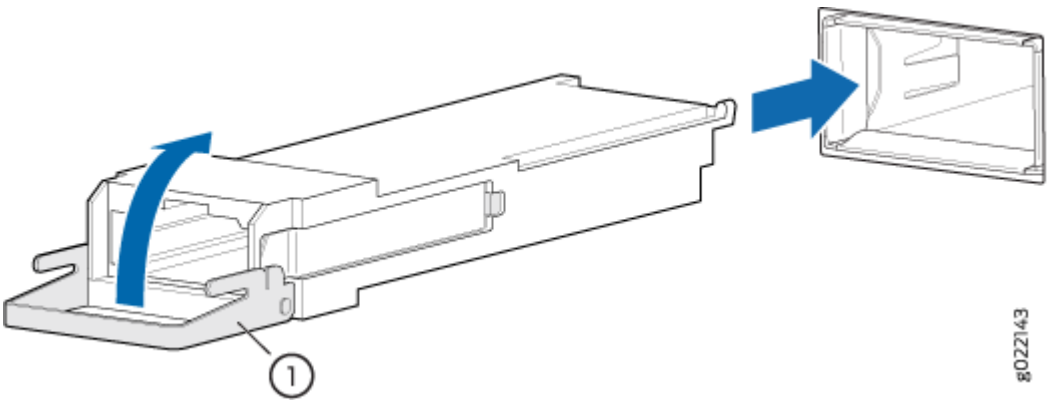
CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

8. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs toward the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

CAUTION: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

CAUTION: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

Figure 108: Install a Transceiver



1– Ejector lever

Install a QSFP28 Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

Ensure that you have a rubber safety cap available to cover the transceiver.

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting the device functions.

NOTE: After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only optical transceivers and optical connectors purchased from Juniper Networks with your Juniper Networks device.

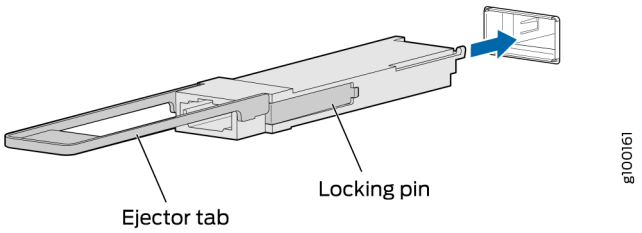
CAUTION: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

To install a QSFP28 transceiver (see Figure 109 on page 176):

1. Wrap and fasten one end of an ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
2. Verify that a rubber safety cap covers the QSFP28 transceiver.
3. Position the transceiver in front of the port on the device so that the QSFP28 connector faces the port.

Figure 109: Install a QSFP28 Transceiver



4. Slide the transceiver into the port until the locking pins lock in place. If there is resistance, remove the transceiver and flip it so that the connector faces the other direction.
5. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

> **LASER WARNING**: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cable connected to a transceiver emit laser light that can damage your eyes.

> **CAUTION**: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

6. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

> **CAUTION**: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

> **CAUTION**: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

Connect a Fiber-Optic Cable

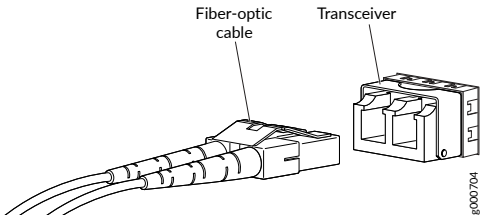
Before you connect a fiber-optic cable to an optical transceiver installed in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

To connect a fiber-optic cable to an optical transceiver installed in a device:

> **LASER WARNING**: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered with a rubber safety cap, remove the cap. Save the cap.
2. Remove the rubber safety cap from the optical transceiver. Save the cap.
3. Insert the cable connector into the optical transceiver (see Figure 110 on page 177).

Figure 110: Connect a Fiber-Optic Cable to an Optical Transceiver Installed in a Device



4. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> **CAUTION**: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

Configure Junos OS on the EX4400

IN THIS SECTION

Connect and Configure an EX4400 Switch by Using the CLI

There are two ways to connect and configure an EX4400 switch: one method is through the console by using the CLI and the other is by using the J-Web interface.

Starting in Junos OS Release 22.3R1, J-Web supports EX4400 switches.

This topic describes the CLI procedure.

Before you connect and configure an EX4400, set the following parameter values on the console server or PC:

- Baud Rate—9600
- Data—8
- Flow Control—None
- Parity—None
- Stop Bits—1
- DCD State—Disregard

Ensure that you have the following parts and tools available:

- An Ethernet cable with an RJ-45 connector attached—not provided
- An RJ-45 to DB-9 serial port adapter—not provided
- A laptop or PC, with a serial port—not provided

Have the following information available before you configure custom settings for the switch:

- Root password
- IP address of the default gateway
- IP address of the management port
- IP address of a DNS server
- (Optional) Hostname
- (Optional) IP address of a backup router
- (Optional) SNMP read community, location, and contact to configure SNMP parameters
- (Optional) Static routes to remote subnets with access to the management port
- (Optional) Static routes to remote prefixes with access to the management port

We ship the EX4400 switch with Junos OS preinstalled and ready to be configured when the switch is powered on. You must perform the initial configuration of the EX4400 through the console port (labeled **CON**) on the rear panel of the switch by using the command-line interface (CLI).

This procedure describes how to perform the initial configuration on the switch and to connect it to the network. For the complete information about enabling the switch to forward traffic, including examples, see the Junos OS configuration guides.

To perform the initial configuration on the switch and to connect it to the network:

1. Power on the switch.
2. Connect the console port (labeled **CON**) to a management host such as a laptop or PC by using an RJ-45 to DB-9 serial port adapter. On EX4400 switch models except EX4400-24X, the console port is on the rear panel. On the EX4400-24X model, the console port is on the front panel.

   NOTE: We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

3. At the Junos OS login prompt, type **root** to log in. You don't need to enter a password. If the software boots before you connect to the console port, you might need to press the Enter key for the prompt to appear.

```
login: root
```

4. Start the CLI.

```
root@:RE:0% cli
root>
```

5. Enter configuration mode.

```
root> configure
[edit]
root#
```

6. Add a password to the root administration user account. Enter a plain-text password, an encrypted password, or an SSH public key string.

```
[edit]
root# set system root-authentication plain-text-password
New password: password
Retype new password: password
```

or

```
[edit]
root# set system root-authentication encrypted-password encrypted-password
```

or

```
[edit]
root# set system root-authentication ssh-ecdsa public-key
```

or

```
[edit]
root# set system root-authentication ssh-ed25519 public-key
```

or

```
[edit]
root# set system root-authentication ssh-rsa public-key
```

7. (Optional) Configure the hostname of the switch. If the name includes spaces, enclose the name in double quotation marks (“ ”).

```
[edit]
root# set system host-name host-name
```

8. (Optional) Create a user account.

```
[edit]
root# set system login user user-name authentication plain-text-password
New password: password
Retype new password: password
```

9. (Optional) Set the user account class to super-user.

```
[edit]
root# set system login user user-name class super-user
```

10. (Optional) Configure the domain name of the switch.

```
[edit]
root# set system domain-name domain-name
```

11. Configure the default gateway.

```
[edit]
root# set routing-options static route 0/0 next-hop address
```

12. Configure the IP address and prefix length for the management interface on the switch.

```
[edit]
root# set interfaces me0 unit 0 family inet address address/prefix-length
```

NOTE: The management port `me0` (labeled **MGMT**) is located on the rear panel of the switch.

13. (Optional) Configure the IP address of a backup router, which is used only while the routing protocol is not running.

```
[edit]
root# set system backup-router address
```

14. Configure the IP address of a DNS server.

```
[edit]
root# set system name-server address
```

15. (Optional) Configure the static routes to remote subnets with access to the management port. Access to the management port is limited to the local subnet.

```
[edit]
root# set routing-options static route remote-subnet next-hop destination-IP retain no-
readvertise
```

16. (Optional) Configure the static routes to remote prefixes with access to the management port.

```
[edit]
root# set routing-options static route remote-prefix next-hop destination-IP retain no-
readvertise
```

17. Configure the SSH service.

```
[edit]
root# set system services ssh root-login allow
```

18. Configure in-band management or out-of-band management:

- With in-band management, you can configure a network port interface as the management interface and connect it to the management device. In this scenario, you can do either of the following:
  - Use the automatically created VLAN named *default* for management of all data interfaces as members of the default VLAN. Specify the management IP address and the default gateway.

- Create a new management VLAN. Specify the VLAN name, VLAN ID, management IP address, and default gateway. Select the ports that must be part of this VLAN.

- With out-of-band management, you use a dedicated management channel to connect to the management device. Specify the IP address and gateway of the management interface. Use this IP address to connect to the switch.

19. (Optional) Specify the SNMP read community, location, and contact to configure SNMP parameters.
20. (Optional) Specify the system date and time. Select the time zone from the list. The configured parameters are displayed.
21. Enter **yes** to commit the configuration. The configuration is committed as the active configuration for the switch.
22. (Optional) Display the configuration to verify that it is correct.
23. (Optional) Configure additional properties by adding the necessary configuration statements.
24. Commit the configuration to activate it on the switch.

```
[edit]
root# commit
```

25. When you have finished configuring the switch, exit configuration mode.

```
[edit]
root@switch# exit
root@switch>
```

You can now log in by using the CLI and continue configuring the switch.

To connect and configure an EX4400 switch by using the J-Web interface, see Connecting and Configuring an EX Series Switch (J-Web Procedure).

EX4400 Default Configuration

Each EX Series switch is programmed with a factory-default configuration that contains the values set for each configuration parameter when the switch is shipped. The default configuration file sets values for system parameters such as `syslog` and `commit`, configures Ethernet switching on all interfaces, enables IGMP snooping, and enables the LLDP and RSTP protocols.

NOTE:

- The factory-default configuration file has more interfaces for models that have more ports.
- The poe statement appears only in models with ports that support PoE-bt.

When you commit changes to the configuration, a new configuration file is created, which becomes the active configuration. You can always revert to the factory-default configuration. See *Revert to the Factory-Default Configuration for the EX Series Switch*.

The following is the factory-default configuration file for an EX4400-24P switch with 24 ports that support PoE-bt. The factory-default configuration file for the other EX4400 models is similar.

```
system {
    commit {
        factory-settings {
            reset-chassis-lcd-menu;
            reset-virtual-chassis-configuration;
        }
    }
services {
        ssh;
        netconf {
            ssh;
            rfc-compliant;
            yang-compliant;
        }
    }
    auto-snapshot;
    syslog {
        file interactive-commands {
            interactive-commands any;
        }
        file messages {
            any notice;
            authorization info;
        }
    }
    phone-home {
        server https://redirect.juniper.net;
        rfc-compliant;
    }
```

```
    ## Warning: missing mandatory statement(s): 'root-authentication'
}
chassis {
    redundancy {
        graceful-switchover;
    }
}
interfaces {
    ge-0/0/0 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/1 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/2 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/3 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/4 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
```

```
    ge-0/0/5 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/6 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/7 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/8 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/9 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/10 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/11 {
```

```
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/12 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/13 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/14 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/15 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/16 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/17 {
        unit 0 {
```

```
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/18 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/19 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/20 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/21 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/22 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    ge-0/0/23 {
        unit 0 {
            family ethernet-switching {
```

```
            storm-control default;
        }
    }
}
et-0/2/0 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
        }
    }
}
xe-0/2/0 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
        }
    }
}
et-0/2/1 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
        }
    }
}
xe-0/2/1 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
        }
    }
}
et-0/2/2 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
        }
    }
}
xe-0/2/2 {
    unit 0 {
        family ethernet-switching {
            storm-control default;
```

```
            }
        }
    }
    et-0/2/3 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    xe-0/2/3 {
        unit 0 {
            family ethernet-switching {
                storm-control default;
            }
        }
    }
    irb {
        unit 0 {
            family inet {
                dhcp;
            }
        }
    }
    vme {
        unit 0 {
            family inet {
                dhcp;
            }
        }
    }
}
forwarding-options {
    storm-control-profiles default {
        all;
    }
}
protocols {
    lldp {
        interface all;
    }
    lldp-med {
        interface all;
```

```
    }
    igmp-snooping {
        vlan default;
    }
    rstp {
        interface all;
    }
}
poe {
    interface all;
}
vlans {
    default {
        vlan-id 1;
        l3-interface irb.0;
    }
}
```

Revert an EX4400 Switch to the Factory-Default Configuration

IN THIS SECTION

If the current active configuration on your switch fails, you can revert to the factory-default configuration. You can also roll back to a previous configuration, as described in Rolling Back Junos OS Configuration Changes.

TIP: If you have lost the root password, it is not necessary to revert to the factory-default configuration to reset it. See Recovering the Root Password on Switches.

The factory-default configuration contains the basic configuration settings for the switch. This is the first configuration of the switch and it is loaded when the switch is first powered on. For the factory-default configuration file for your switch, see the hardware documentation for your switch.

NOTE: To revert a member switch of a Virtual Chassis to the factory-default configuration, disconnect the cables connected to the VCPs to avoid affecting Virtual Chassis configuration parameters (member ID, primary-role priority, and setting of VCP uplinks) on other members (see *Disconnect a Fiber-Optic Cable*).

You can revert to the factory-default configuration by using the `request system zeroize` operational command or the `load factory-default` configuration command. You can also use the `load factory-default` command to revert to the factory-default configuration file that contains all default settings *except* the root password setting, which is retained.

We describe these procedures in the following sections:

Revert to the Factory-Default Configuration by Using the request system zeroize Command

The `request system zeroize` command is a standard Junos OS operational mode command that removes all configuration information and resets all key values. The operation unlinks all user-created data files, including customized configuration and log files, from their directories. The switch then reboots and reverts to the factory-default configuration.

To completely erase user-created data so that it is unrecoverable, use the `request system zeroize media` command.

CAUTION: Before issuing `request system zeroize`, use the `request system snapshot` command to back up the files currently used to run the switch to a secondary device.

1. To revert to the factory-default configuration by using the `request system zeroize` command:

```
user@switch> request system zeroize warning: System will be rebooted and may not boot without
configurationErase all data, including configuration and log files? [yes,no]
(yes)
```

2. Type `yes` to remove configuration and log files and revert to the factory-default configuration.

NOTE: The `auto-image-upgrade` statement is added at the `[edit chassis]` hierarchy level when you use this procedure. Thus, the automatic image upgrade feature is made available on the switch.

Revert to the Factory-Default Configuration by Using the load factory-default Command

The `load factory-default` command is a standard Junos OS configuration command that replaces the current active configuration with the factory-default configuration (except the root password setting, which by default is not set but which you must set in order to commit the new configuration in this procedure).

If you want to run the EZsetup script to complete the initial configuration of the switch after you revert to the factory-default configuration, do not use the `load factory-default` command. Instead, do the reversion by using the `request system zeroize` command. If you use the `load factory-default` command to revert to the factory-default configuration, the configuration for the root password is retained and the EZsetup script will not run.

To revert to the factory-default configuration by using the `load factory-default` command:

NOTE: If you use this procedure, you must delete the system commit factory settings, set the root password, and commit the configuration. These steps are not required when you revert to the factory-default configuration by using `request system zeroize`. Also, the `auto-image-upgrade` statement is not added to the configuration when you use this procedure; it *is* added to the configuration when you use `request system zeroize`.

1. [edit]
   user@switch# `load factory-default`
2. [edit]
   user@switch# `delete system commit factory-settings`
3. [edit]
   user@switch# `set system root-authentication plain-text-password`
4. [edit]
   user@switch# `commit`
5. Check the member ID and primary-role priority with the `show virtual-chassis` command and check to see whether there are remaining settings for uplink VCPs by using the `show virtual-chassis vc-port` command.

Revert to the Factory-Default Configuration by Using the Factory Reset/Mode Button

To revert to the factory-default configuration by using the factory reset/mode button:

1. Press the factory reset/mode button on the far right side of the front panel for 10 seconds. The switch transitions into factory-default configuration, the console displays **committing factory default configuration**, and the Link/Activity LED on the network ports and the QSFP28 ports is lit steadily green.
2. Commit the configuration by using the CLI.
3. Press the factory reset/mode button for 10 more seconds. The switch transitions into initial setup mode.

   EZSetup configures DHCP and enables the J-Web user interface on the switch. You can use EZSetup only on a standalone switch that is in the factory default configuration. For information about EZSetup, see Connecting and Configuring an EX Series Switch (J-Web Procedure).

The Factory Reset/Mode button is enabled by default. You can disable the button using the CLI.

To disable the Factory Reset/Mode button, run the following commands:

1. [edit]
   user@switch# `set chassis config-button no-clear`
2. [edit]
   user@switch# `commit`

To enable the Factory Reset/Mode button, run the following commands:

1. [edit]
   user@switch# `delete chassis config-button no-clear`
2. [edit]
   user@switch# `commit`

5

CHAPTER

Maintain Components

Maintain the EX4400 Cooling System

IN THIS SECTION

Remove a Fan Module from an EX4400 Switch

Before you remove a fan module:

- Ensure that you understand how to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An antistatic bag or an antistatic mat—not provided
  - An ESD grounding strap—not provided
  - A replacement fan module

We ship EX4400 switches with 1+1 redundant fan modules preinstalled in the rear panel. The fan modules in EX4400 switches are hot-removable and hot-insertable field-replaceable unit (FRU) installed in the rear panel of the switch: You can remove and replace them without powering off the switch or disrupting switch functions.

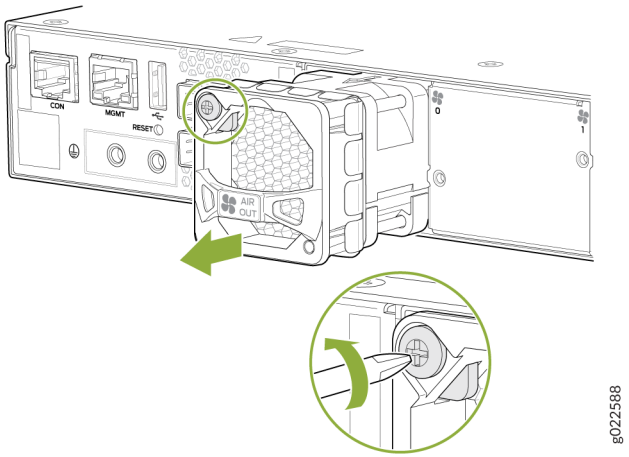
To remove a fan module:

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Loosen the captive screws on the front bezel of the fan module by using the screwdriver.

WARNING: To prevent injury, do not touch the fan with your hands or any tools as you slide the fan module out of the chassis—the fan might still be running.

4. Grasp the handle on the fan module and pull it firmly to slide the fan module out of the chassis (see Figure 111 on page 197).

Figure 111: Remove a Fan Module from the EX4400 Switch



5. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

CAUTION: Do not mix:

- Fan modules with different airflow directions in the same chassis.
- Power supplies and fan modules with different airflow directions in the same chassis.

If you install power supplies or fan modules with different airflow directions, Junos OS raises an alarm.

6. Install the replacement fan.

NOTE: You must install all the fan modules and they must be operational for optimal functioning of the switch.

If the switch is operational while you are replacing fan modules, you must remove only one fan module at a time. The switch continues to operate for 60 seconds without thermal shutdown while you are replacing a fan module.

Install a Fan Module in an EX4400 Switch

Before you install a fan module in the switch:

- Ensure that you understand how to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have the correct fan module. If the label on the installed power supply is **AIR IN**, you must install a fan module with the label **AIR IN**. If the label on the installed power supply is **AIR OUT**, you must install a fan module with the label **AIR OUT**.
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An ESD grounding strap—not provided

We ship EX4400 switches with 1+1 redundant fan modules preinstalled in the rear panel. The fan modules in EX4400 switches are hot-removable and hot-insertable field-replaceable unit (FRU) installed in the rear panel of the switch: You can remove and replace them without powering off the switch or disrupting switch functions.

CAUTION: Do not mix:

- Fan modules with different airflow directions in the same chassis.
- Power supplies and fan modules with different airflow directions in the same chassis.

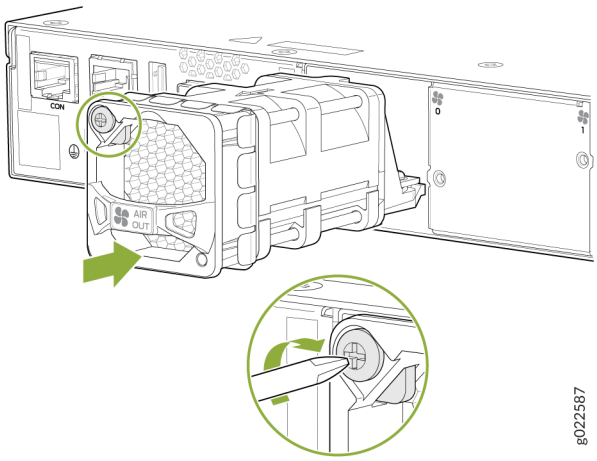
If you install power supplies or fan modules with different airflow directions, Junos OS raises an alarm.

To install a fan module:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the fan module from its bag.
3. Hold the handle of the fan module with one hand and support the weight of the module with the other hand. Place the fan module in the fan module slot on the rear panel of the switch and slide it in until it is fully seated.

4. Tighten the captive screws on the front bezel of the fan module by using the screwdriver (see Figure 112 on page 199 .

Figure 112: Install a Fan Module in the EX4400 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

NOTE: You must install all the fan modules and they must be operational for optimal functioning of the switch.

The switch continues to operate for 60 seconds without thermal shutdown while you are replacing a fan module.

Maintain the EX4400 Power System

IN THIS SECTION

Install a Power Supply in an EX4400 Switch | 202

Remove a Power Supply from an EX4400 Switch

Before you remove a power supply from an EX4400 switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An antistatic bag or an antistatic mat—not provided
  - An ESD grounding strap—not provided
  - A replacement power supply

We ship EX4400 switches with one AC or DC power supply preinstalled in the rear panel. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running: You can remove and replace either one of them without powering off the switch or disrupting switch functions.

CAUTION: Replace the power supply with a new power supply within one minute of removal to prevent chassis overheating.

To remove a power supply:

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.

   NOTE: If only one power supply is installed in your EX4400, you need to power off the switch before removing the power supply.

3. Disconnect power to the switch:

- AC power supply—If the AC power source outlet has a power switch, set it to the off position. If the AC power source outlet does not have a power switch, gently pull out the plug end of the power cord connected to the power source outlet.
- DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.

4. Remove the power source cable from the power supply faceplate:
   - AC power supply—Detach the power cord retainer by using your hands, and gently pull out the power cord.
   - DC power supply—Loosen the screws securing the DC power source cable by using the screwdriver, and gently pull out the power cord.
5. Push the ejector lever toward the handle until it stops.
6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
7. Place one hand under the power supply to support it and then slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections (see Figure 113 on page 201 and Figure 114 on page 201).

Figure 113: Remove an AC Power Supply from the EX4400 Switch

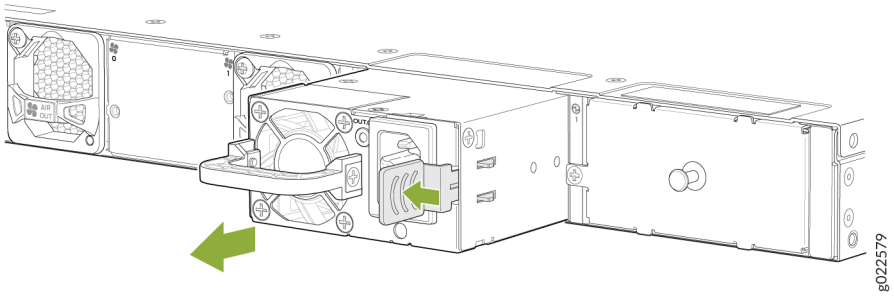
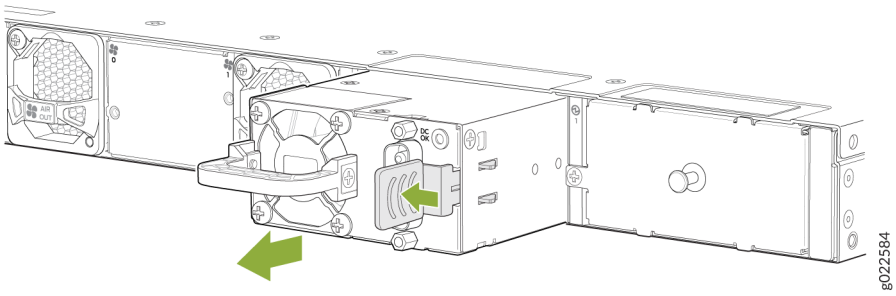


Figure 114: Remove a DC Power Supply from the EX4400 Switch



8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
9. Install the replacement power supply.

> **NOTE**: You must install both the power supplies and they must be operational for optimal functioning of the switch.

Install a Power Supply in an EX4400 Switch

Before you install a power supply:

- Ensure that you understand how to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have the correct power supply. If the label on the installed fan module is **AIR IN**, you must install a power supply with the label **AIR IN**. If the label on the installed fan module is **AIR OUT**, you must install a power supply with the label **AIR OUT**.
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An ESD grounding strap—not provided

We ship EX4400 switches with one AC or DC power supply preinstalled in the rear panel. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can remove and replace either one of them without powering off the switch or disrupting switch functions.

> ⚠ **CAUTION**: Do not mix:
>
> - AC and DC power supplies in the same chassis.
> - Different models of power supplies (such as 550-W, 1050-W, and 1600-W models) in the same chassis.
> - Power supplies with different airflow directions in the same chassis.
> - Power supplies and fan modules with different airflow directions in the same chassis.

To install a power supply:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Taking care not to touch power supply pins, leads, or solder connections, remove the power supply from its bag.
3. If you are installing an AC power supply, push the end of the retainer strip into the hole below the inlet on the power supply faceplate until it snaps into place.
4. Using both hands, place the power supply in the power supply slot on the rear panel of the switch and slide it in until it is fully seated and the ejector lever fits into place (see Figure 115 on page 203 and Figure 116 on page 203).

Figure 115: Install an AC Power Supply in the EX4400 Switch

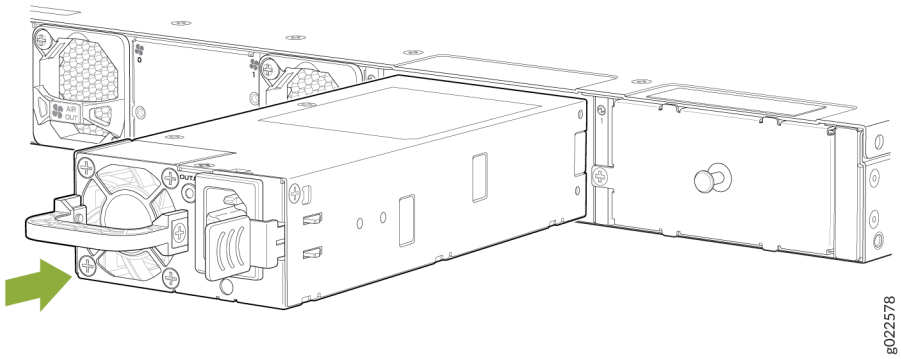
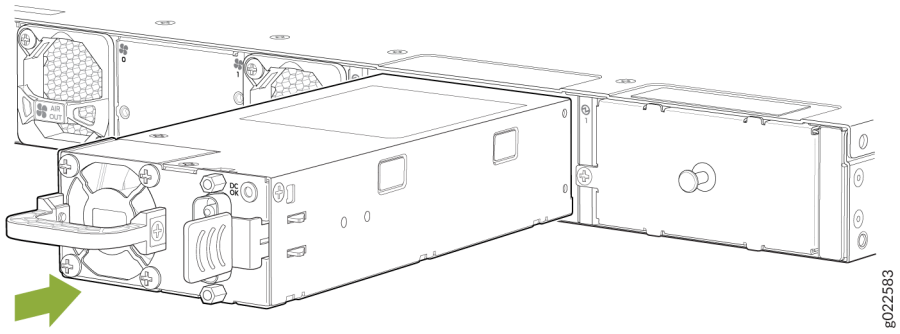


Figure 116: Install a DC Power Supply in the EX4400 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/

updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

NOTE: You must install both the power supplies and they must be operational for optimal functioning of the switch.

Maintain the EX4400 Extension Modules

IN THIS SECTION

Remove an Extension Module from an EX4400 Switch

Before you remove an extension module from an EX4400 switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see Prevention of Electrostatic Discharge Damage).
- If there are any transceivers installed in the extension module, remove them before you remove the extension module. For instructions on removing transceivers, see "Maintain Transceivers" on page 210 .
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An antistatic bag or an antistatic mat—not provided
  - An ESD grounding strap—not provided
  - A replacement extension module or cover for the empty extension module slot

The extension module in EX4400 switches is a hot-removable and hot-insertable field-replaceable unit (FRU). You can remove and replace an extension module without powering off the switch or disrupting switch functions.

CAUTION: We recommend that you install either a replacement extension module or a cover over the empty module slot to reduce the risk of objects or substances entering the chassis and to ensure optimal cooling of the switch.

To remove an extension module:

1. Take the extension module offline by issuing the following CLI command:

```
user@switch> request chassis pic offline fpc-slot slot-number pic-slot slot-number
```

2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
3. Loosen both captive screws on the faceplate of the extension module by using your fingers. If you are unable to unscrew the captive screws by using your fingers, use the screwdriver.

CAUTION: Do not pull the extension module out of the module slot by holding the faceplate of the extension module.

4. Hold both the ejector handles or the captive screws on the extension module and gently pull the extension module toward you and out of the module slot (see Figure 117 on page 206 , Figure 118 on page 206 , and Figure 119 on page 207).

Figure 117: Remove a 1x100GbE QSFP28 Extension Module from the EX4400 Switch

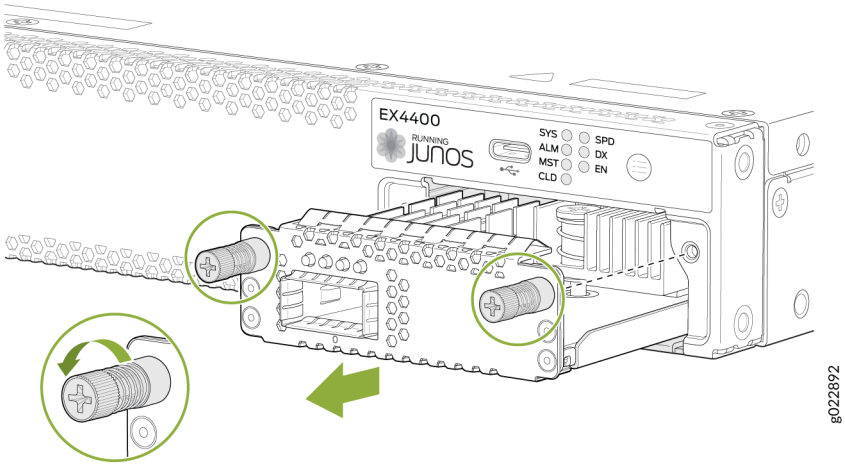


Figure 118: Remove a 4x10GbE SFP+ Extension Module from the EX4400 Switch

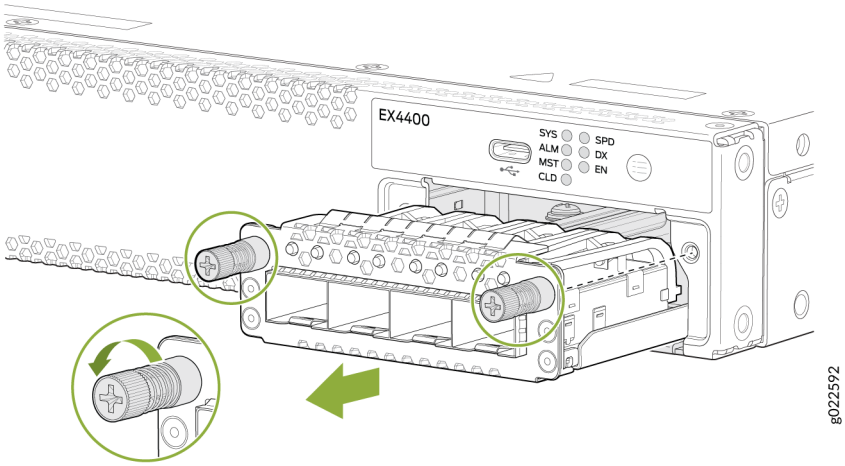
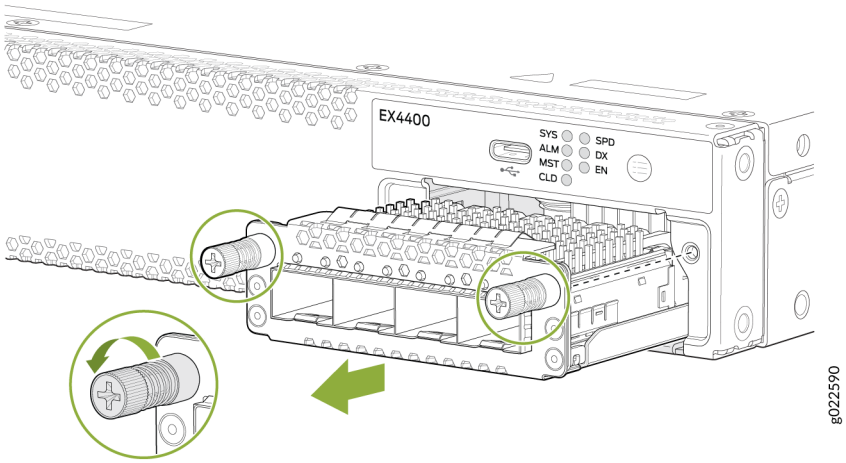


Figure 119: Remove a 4x25GbE SFP28 Extension Module from the EX4400 Switch



5. Place the extension module in an antistatic bag or on an antistatic mat placed on a flat, stable surface.
6. If you are not replacing the extension module, install the cover over the empty slot.

> **NOTE**: After you have removed an extension module, wait for at least 10 seconds before you install an extension module. If you do not wait for at least 10 seconds, the interfaces on the extension module might not come up.

Install an Extension Module in an EX4400 Switch

Before you begin installing an extension module in the switch:

- Ensure that you have taken the necessary precautions to prevent ESD damage (see Prevention of Electrostatic Discharge Damage).
- Ensure that you have the following parts and tools available:
  - Number 2 Phillips (+) screwdriver—not provided
  - An ESD grounding strap—not provided (If a grounding strap is not available, follow the alternative grounding method described in Step 1 of the following procedure.)

You can install an extension module in the front panel of an EX4400 switch. The extension module in EX4400 switches is a hot-removable and hot-insertable unit (FRU). You can remove and replace an extension module without powering off the switch.

NOTE: Extension modules are not part of the shipping configuration. If you want to purchase them, you must order them separately and register them (see "Register Products—Mandatory to Validate SLAs" on page 144).

To install an extension module:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.

   If a grounding strap is not available, hold the extension module in its antistatic bag in one hand and touch the exposed, bare metal of the switch with the other hand to ground yourself and the component.
2. If the extension module slot has a cover on it, loosen both the screws on the cover by using your fingers. If you are unable to unscrew the screws by using your fingers, use the screwdriver. Hold both the screws and gently pull the cover outward, and save it for later use.

   NOTE: If you are removing an extension module and installing another extension module, wait for at least 10 seconds after removing the extension module before installing the new or the same extension module. If you do not wait for at least 10 seconds, the interfaces on the extension module might not come up.
3. Taking care not to touch module components, pins, leads, or solder connections, remove the extension module from its bag.

   ⚠ **CAUTION**: Before you slide the extension module into the slot on the switch chassis, ensure the extension module is aligned correctly. Misalignment might cause the pins to bend, making the extension module unusable.
4. Using both hands, place the module in the empty slot and slide it in gently until it is fully seated.
5. Tighten both the captive screws by using your fingers or the screwdriver (see Figure 120 on page 209 , Figure 121 on page 209 , and Figure 122 on page 210).

Figure 120: Install a 1x100GbE QSFP28 Extension Module in the EX4400 Switch

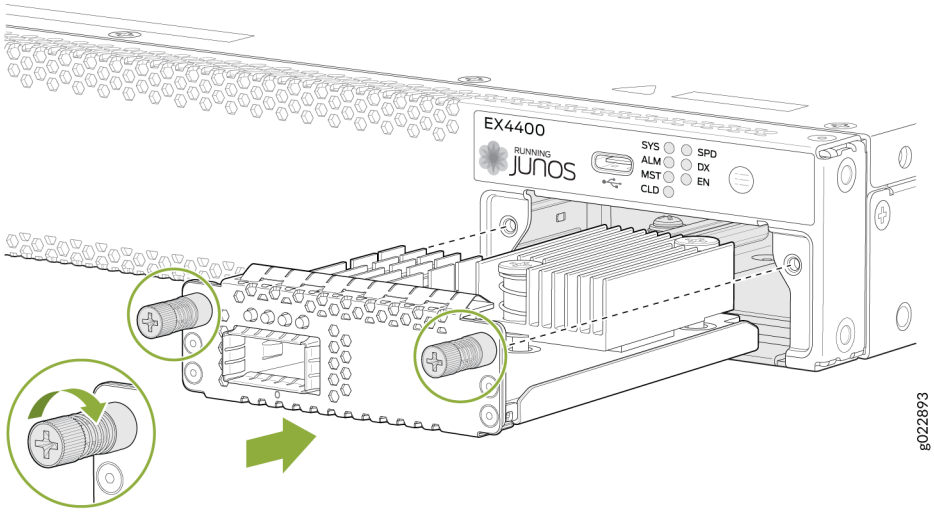


Figure 121: Install a 4x10GbE SFP+ Extension Module in the EX4400 Switch

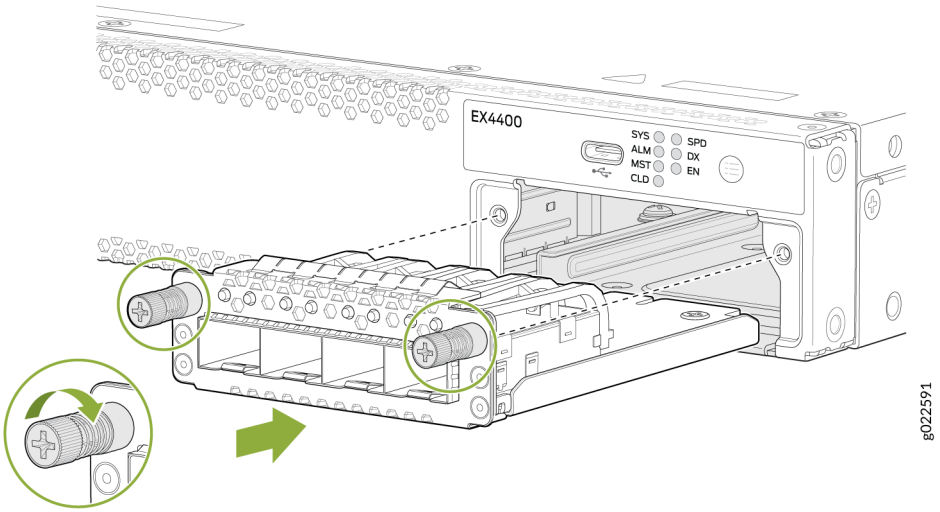
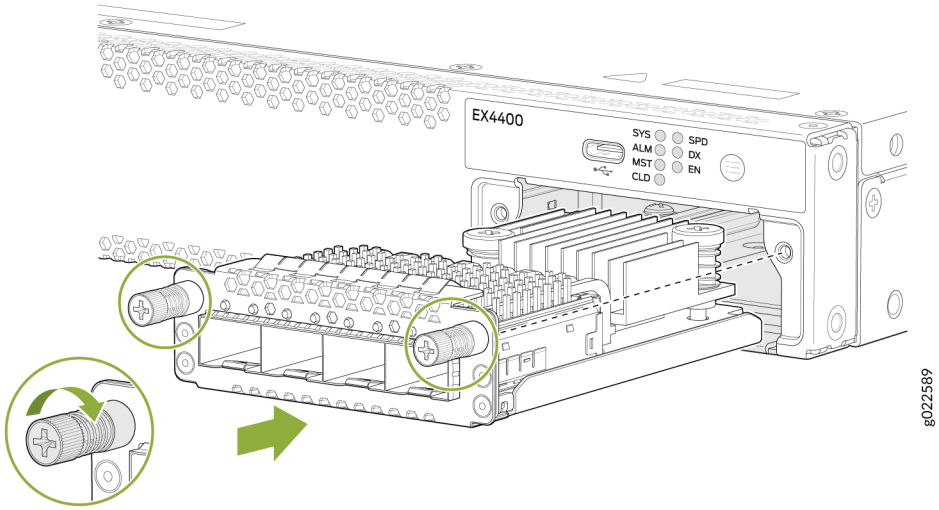


Figure 122: Install a 4x25GbE SFP28 Extension Module in the EX4400 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Maintain Transceivers

IN THIS SECTION

Remove a Transceiver

Before you remove a transceiver from a device, ensure that you have taken the necessary precautions for the safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat
- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- A dust cover to cover the port or a replacement transceiver

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting device functions.

NOTE: After you remove a transceiver, or when you change the media-type configuration, wait for 6 seconds for the interface to display the operational commands.

Figure 123 on page 213 shows how to remove a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To remove a transceiver from a device:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
3. Label the cable connected to the transceiver so that you can reconnect it correctly.

LASER WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

LASER WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

4. Remove the cable connected to the transceiver (see *Disconnect a Fiber-Optic Cable*). Cover the transceiver and the end of each fiber-optic cable connector with a rubber safety cap immediately after disconnecting the fiber-optic cables.
5. If there is a cable management system, arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

CAUTION: Do not bend the fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

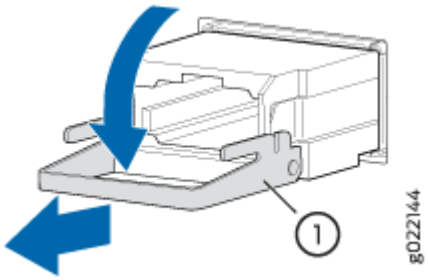
6. To remove an SFP, SFP+, XFP, or a QSFP+ transceiver:
   a. Using your fingers, pull open the ejector lever on the transceiver to unlock the transceiver.

CAUTION: Before removing the transceiver, make sure that you open the ejector lever completely until you hear it click. This prevents damage to the transceiver.

   b. Grasp the transceiver ejector lever and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

CAUTION: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Figure 123: Remove a QSFP+ Transceiver



1– Ejector lever

To remove a CFP transceiver:

a. Using your fingers, loosen the screws on the transceiver.

b. Grasp the screws on the transceiver and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

> **CAUTION**: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. Using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Place the transceiver in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
9. Place the dust cover over the empty port, or install the replacement transceiver.

Install a Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have a rubber safety cap available to cover the transceiver.

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting the device functions.

> **NOTE**: After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only optical transceivers and optical connectors purchased from Juniper Networks with your Juniper Networks device.

CAUTION: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

Figure 124 on page 216 shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To install a transceiver:

CAUTION: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
2. Remove the transceiver from its bag.
3. Check to see whether the transceiver is covered with a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

LASER WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

4. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover and save it in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.
5. Using both hands, carefully place the transceiver in the empty port. The connectors must face the chassis.

CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable.

6. Slide the transceiver in gently until it is fully seated. If you are installing a CFP transceiver, use your fingers to tighten the captive screws on the transceiver.
7. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

LASER WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cable connected to a transceiver emit laser light that can damage your eyes.

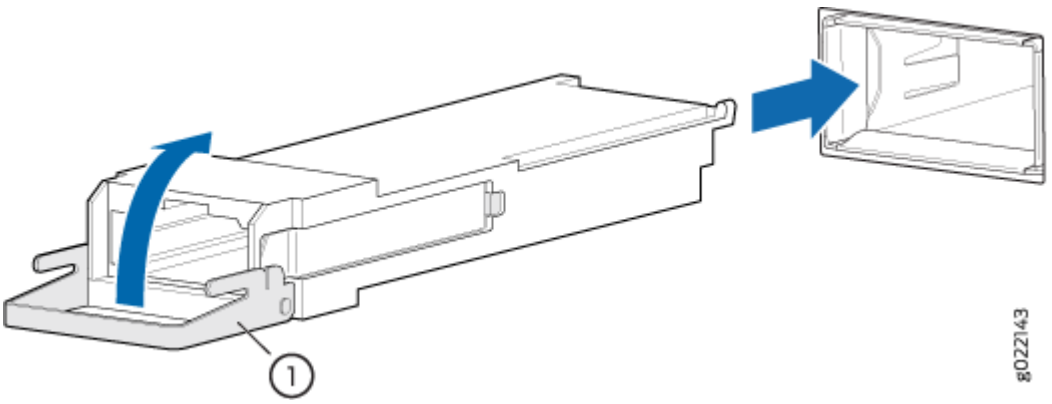
CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

8. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs toward the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

CAUTION: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

CAUTION: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

Figure 124: Install a Transceiver



1– Ejector lever

Maintain Fiber-Optic Cables

IN THIS SECTION

Connect a Fiber-Optic Cable

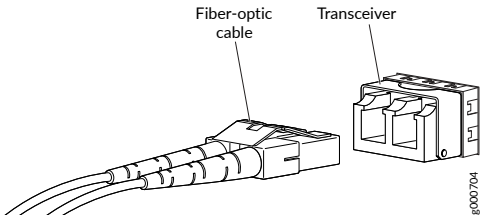
Before you connect a fiber-optic cable to an optical transceiver installed in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

To connect a fiber-optic cable to an optical transceiver installed in a device:

> **LASER WARNING**: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered with a rubber safety cap, remove the cap. Save the cap.
2. Remove the rubber safety cap from the optical transceiver. Save the cap.
3. Insert the cable connector into the optical transceiver (see Figure 125 on page 217).

Figure 125: Connect a Fiber-Optic Cable to an Optical Transceiver Installed in a Device



4. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> **CAUTION**: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

Disconnect a Fiber-Optic Cable

Before you disconnect a fiber-optic cable from an optical transceiver, ensure that you have taken the necessary precautions for safe handling of lasers. See *Laser and LED Safety Guidelines and Warnings*.

Ensure that you have the following parts and tools available:

- A rubber safety cap to cover the transceiver
- A rubber safety cap to cover the fiber-optic cable connector

Juniper Networks devices have optical transceivers to which you can connect fiber-optic cables.

To disconnect a fiber-optic cable from an optical transceiver installed in the device:

1. Disable the port in which the transceiver is installed by issuing the following command:

```
[edit interfaces]
user@device# set interface-name disable
```

LASER WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

2. Carefully unplug the fiber-optic cable connector from the transceiver.
3. Cover the transceiver with a rubber safety cap.

LASER WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

4. Cover the fiber-optic cable connector with the rubber safety cap.

How to Handle Fiber-Optic Cables

Fiber-optic cables connect to optical transceivers that are installed in Juniper Networks devices.

Follow these guidelines when handling fiber-optic cables:

- When you unplug a fiber-optic cable from a transceiver, place rubber safety caps over the transceiver and on the end of the cable.
- Anchor fiber-optic cables to prevent stress on the connectors. When attaching a fiber-optic cable to a transceiver, be sure to secure the fiber-optic cable so that it does not support its own weight as it hangs to the floor. Never let a fiber-optic cable hang free from the connector.
- Avoid bending fiber-optic cables beyond their minimum bend radius. Bending fiber-optic cables into arcs smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cables in and out of optical instruments can damage the instruments, which are expensive to repair. To prevent damage from overuse, attach a short fiber extension to the optical equipment. The short fiber extension absorbs wear and tear due to frequent plugging and unplugging, which is easier and less expensive to replace than the instruments.
- Keep fiber-optic cable connections clean. Microdeposits of oil and dust in the canal of the transceiver or cable connector can cause loss of light, reduction in signal power, and possibly intermittent problems with the optical connection.
  - To clean the transceiver canal, use an appropriate fiber-cleaning device such as RIFOCS Fiber Optic Adaptor Cleaning Wands (part number 946). Follow the instructions in the cleaning kit you use.
  - After cleaning the transceiver, make sure that the connector tip of the fiber-optic cable is clean. Use only an approved alcohol-free fiber-optic cable cleaning kit such as the Opptex Cletop-S®Fiber Cleaner. Follow the instructions in the cleaning kit you use.

Maintain Breakout Cables

IN THIS SECTION

Breakout cables have one transceiver preattached to one end and more than one transceiver preattached to the other end. You can use the cables to channelize a port and increase the number of interfaces. For example, you can channelize the QSFP28 ports on the rear panel of EX4400 switches by

connecting breakout cables and by using CLI configuration when those ports are configured as network ports (see *Port Settings*).

Disconnect a Breakout Cable

Before you disconnect a breakout cable from a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from all the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect a breakout cable:

1. Disable the port to which the cable is connected by issuing the following command:

```
[edit interfaces]
user@device# set interface-name disable
```

2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from all the devices it is connected to.
3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

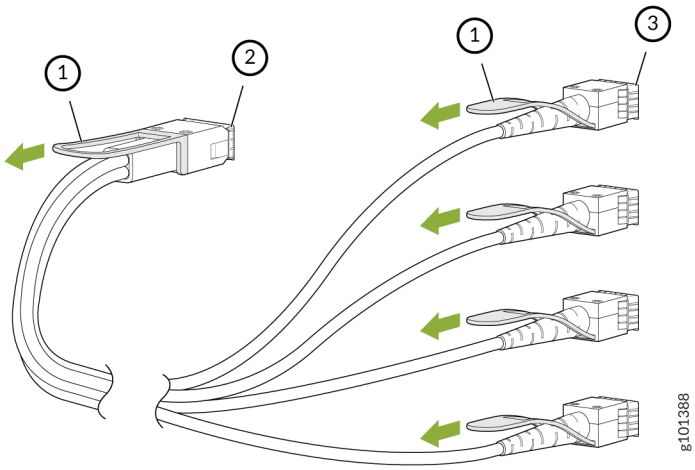
CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it (see Figure 126 on page 221).

Figure 126: Disconnect a Breakout Cable



1– Tab to pull the transceiver	3– Port at the other end
2– Channelized port on a device	

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

CAUTION: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.
10. If you are disconnecting the cable from all the devices it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of breakout cables is the same as the procedure described in this topic.

Connect a Breakout Cable

CAUTION: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

If you are connecting an active optic breakout cable to a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have an electrostatic discharge (ESD) grounding strap (not provided).

NOTE: After you connect a cable or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only cables purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you face a problem running a Juniper Networks device that uses a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

To connect a breakout cable:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.

   CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.

4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

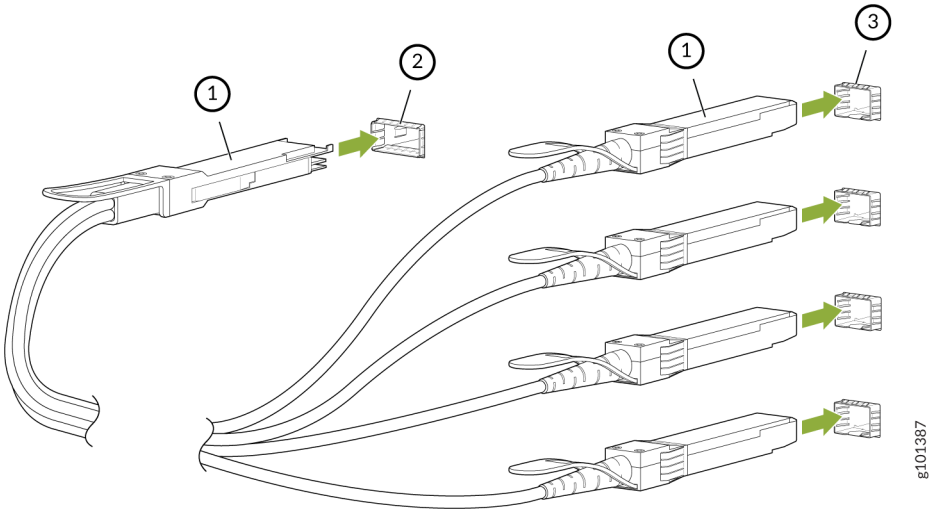
   CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the cable unusable.

   Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

   Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated (see Figure 127 on page 223).

Figure 127: Connect a Breakout Cable



1– Transceiver	3– Ports at the other end
2– Channelized port on a device	

6. Repeat Step 5 for all ports to which the cable must be connected.
7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

The procedure to connect other types of breakout cables is the same as the procedure described in this topic.

Maintain Direct Attach Cables

IN THIS SECTION

A direct attach cable has a transceiver preattached to each end.

Disconnect a Direct Attach Cable

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from both the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect a direct attach cable:

1. Disable the port to which the cable is connected by issuing the following command:

```
[edit interfaces]
user@device# set interface-name disable
```

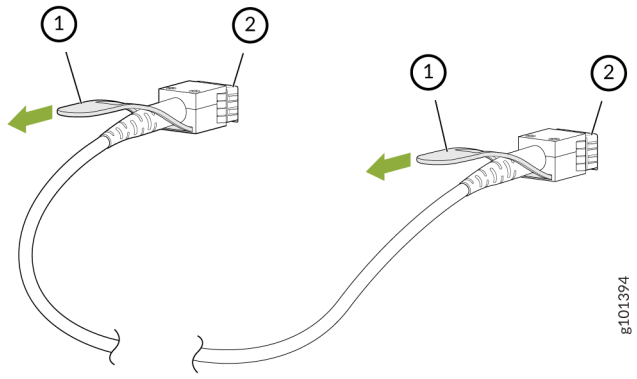
2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from both the ports it is connected to.

3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

> **CAUTION**: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.
>
> Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

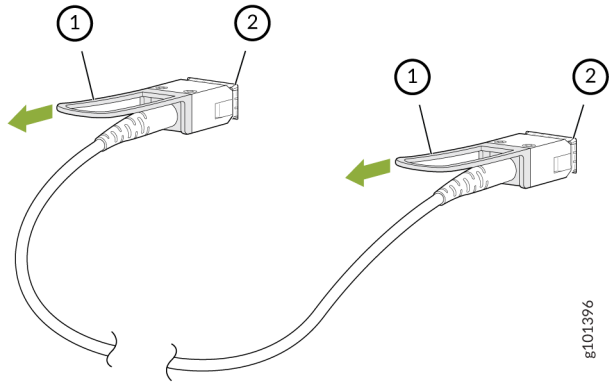
5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it (see Figure 128 on page 225 and Figure 129 on page 226).

Figure 128: Disconnect an SFP28 or SFP+ Direct Attach Cable



1– Tab to pull the transceiver	2– Port on the device

Figure 129: Disconnect a SFP28, SFP+, or QSFP-DD Direct Attach Cable



1– Tab to pull the transceiver	2– Port on the device

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

> **CAUTION**: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. If you are disconnecting the cable from both the ports it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of direct attach cables, other than direct attach breakout cables, is the same as the procedure described in this topic.

Connect a Direct Attach Cable

> **CAUTION**: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Ensure that you have an ESD grounding strap (not provided).

NOTE: After you connect a cable or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only cables purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you face a problem running a Juniper Networks device that uses a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

To connect a direct attach cable:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.

   CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.
4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

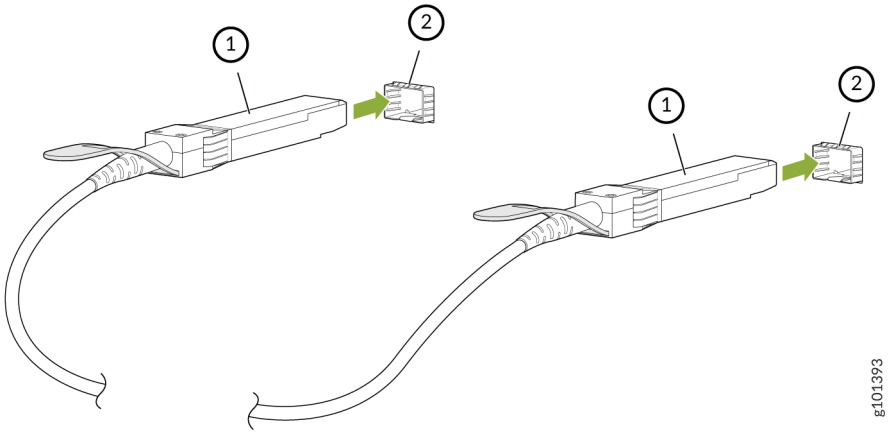
   CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the cable unusable.

   Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

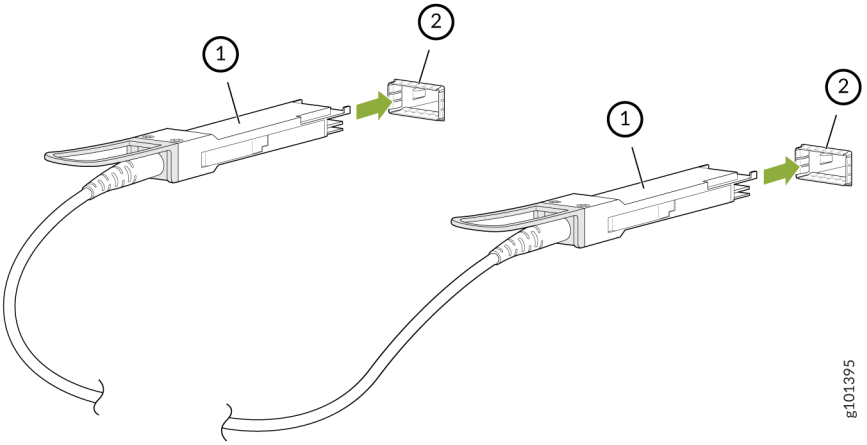
5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated (see Figure 130 on page 228 and Figure 131 on page 228).

Figure 130: Connect an SFP28 or SFP+ Direct Attach Cable



1– Transceiver	2– Port on the device

Figure 131: Connect a SFP28, SFP+, or QSFP-DD Direct Attach Cable



1– Transceiver	2– Port on the device

6. Repeat Step 5 for all ports to which the cable must be connected.

7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

The procedure to connect other types of direct attach cables, other than direct attach breakout cables, is the same as the procedure described in this topic.

Maintain Active Optical Cables

IN THIS SECTION

An active optical cable (AOC) is an optical fiber cable that has a transceiver preattached to each end.

Disconnect an Active Optical Cable

Before you disconnect an active optical cable (AOC) from a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from all the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect an active optical cable:

1. Disable the port to which the cable is connected by issuing the following command:

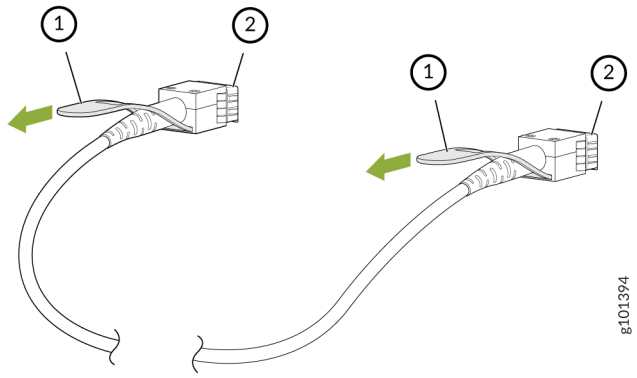
```
[edit interfaces]
user@device# set interface-name disable
```

2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from both the ports it is connected to.
3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

> **CAUTION**: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.
>
> Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

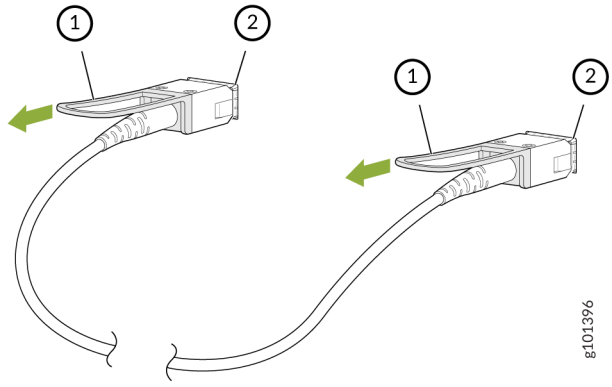
5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it (see Figure 132 on page 230 and Figure 133 on page 231).

Figure 132: Disconnect an SFP28 or SFP+ Active Optical Cable



1– Tab to pull the transceiver	2– Port on the device

Figure 133: Disconnect a QSFP28 or QSFP+ Active Optical Cable



1– Tab to pull the transceiver	2– Port on the device

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

> **CAUTION**: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. If you are disconnecting the cable from both the ports it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of AOCs, other than direct attach AOCs, is the same as the procedure described in this topic.

Connect an Active Optical Cable

Before you connect an AOC to a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

> **CAUTION**: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Ensure that you have an ESD grounding strap (not provided).

NOTE: After you connect a cable or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only cables purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you face a problem running a Juniper Networks device that uses a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

To connect an active optical cable:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.

   CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.
4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

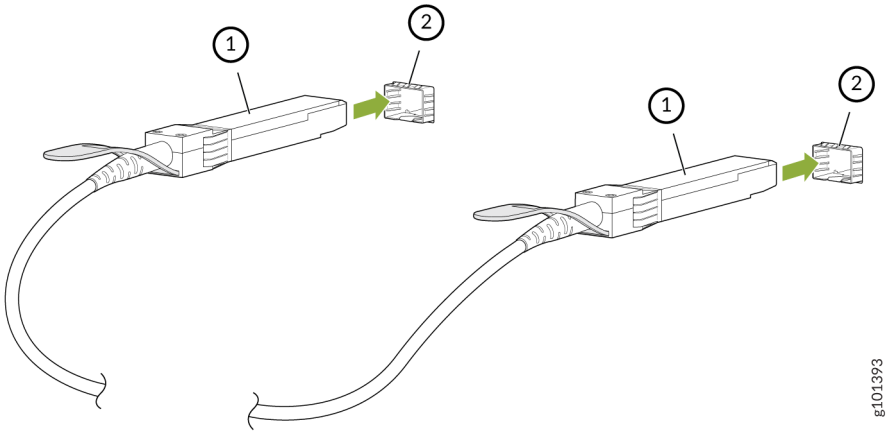
   CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the cable unusable.

   Do not bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

Do not let the cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

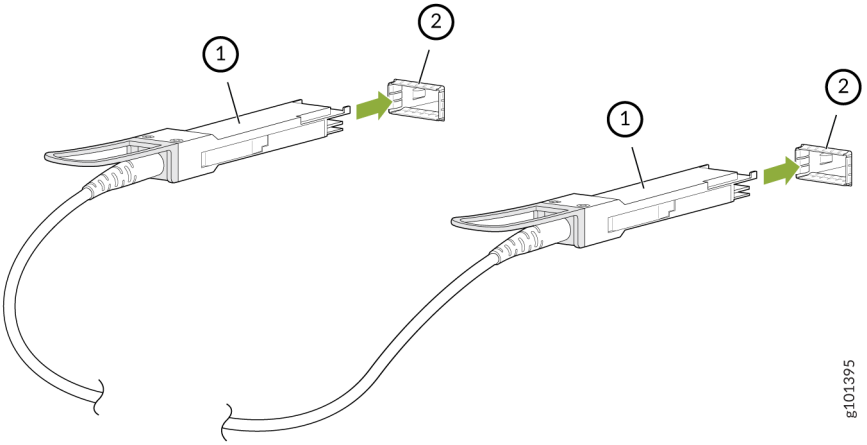
5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated (see Figure 134 on page 233 and Figure 135 on page 233).

Figure 134: Connect an SFP28 or SFP+ Active Optical Cable



1– Transceiver	2– Port on the device

Figure 135: Connect a QSFP28 or QSFP+ Active Optical Cable



1– Transceiver	2– Port on the device

6. Repeat Step 5 for all ports to which the cable must be connected.

7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

The procedure to connect other types of AOCs, other than direct attach AOCs, is the same as the procedure described in this topic.

CHAPTER 6

Troubleshoot Hardware

Troubleshoot the EX4400 Components

IN THIS SECTION

Troubleshoot Temperature Alarms in EX Series Switches

IN THIS SECTION

Problem

Description

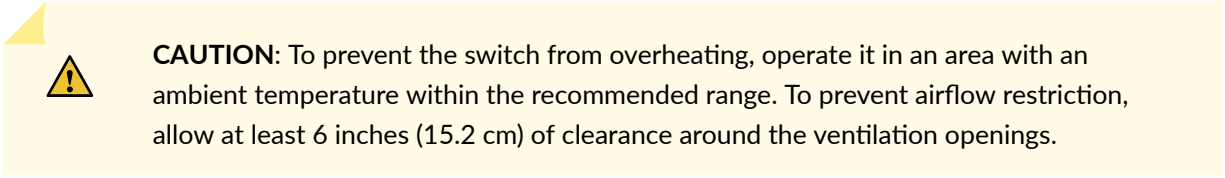
EX Series switches trigger a temperature alarm `FPC 0 EX-PFE1 Temp Too Hot` when the switch temperature becomes too hot.

Cause

Temperature sensors in the chassis monitor the temperature of the chassis. The switch triggers an alarm if a fan fails or if the temperature of the chassis exceeds permissible levels for some other reason.

Solution

When the switch triggers a temperature alarm such as the `FPC 0 EX-PFE1 Temp Too Hot` alarm, use the `show chassis environment` and the `show chassis temperature-thresholds` commands to identify the condition that triggered the alarm.



CAUTION: To prevent the switch from overheating, operate it in an area with an ambient temperature within the recommended range. To prevent airflow restriction, allow at least 6 inches (15.2 cm) of clearance around the ventilation openings.

1. Connect to the switch by using Telnet, and issue the `show chassis environment` command. This command displays environmental information about the switch chassis, including the temperature. The command also displays information about the fans, power supplies, and Routing Engines. Following is a sample output on an EX9208 switch. The output is similar on other EX Series switches.

   show chassis environment (EX9208 Switch)

```
user@switch> show chassis environment

Class Item                          Status     Measurement
Temp  PEM 0                         OK         40 degrees C / 104 degrees F
      PEM 1                         OK         40 degrees C / 104 degrees F
      PEM 2                         Absent
      PEM 3                         Absent
      Routing Engine 0              OK         37 degrees C / 98 degrees F
      Routing Engine 0 CPU          OK         35 degrees C / 95 degrees F
      Routing Engine 1              Absent
      Routing Engine 1 CPU          Absent
      CB 0 Intake                   OK         36 degrees C / 96 degrees F
      CB 0 Exhaust A                OK         34 degrees C / 93 degrees F
      CB 0 Exhaust B                OK         40 degrees C / 104 degrees F
      CB 0 ACBC                     OK         39 degrees C / 102 degrees F
      CB 0 XF A                     OK         46 degrees C / 114 degrees F
      CB 0 XF B                     OK         45 degrees C / 113 degrees F
      CB 1 Intake                   Absent
      CB 1 Exhaust A                Absent
      CB 1 Exhaust B                Absent
      CB 1 ACBC                     Absent
      CB 1 XF A                     Absent
      CB 1 XF B                     Absent
      FPC 3 Intake                  OK         48 degrees C / 118 degrees F
      FPC 3 Exhaust A               OK         46 degrees C / 114 degrees F
```

```
      FPC 3 Exhaust B               OK          51 degrees C / 123 degrees F
      FPC 3 XL TSen                 OK          67 degrees C / 152 degrees F
      FPC 3 XL Chip                 OK          58 degrees C / 136 degrees F
      FPC 3 XL_XR0 TSen             OK          67 degrees C / 152 degrees F
      FPC 3 XL_XR0 Chip             OK          51 degrees C / 123 degrees F
      FPC 3 XL_XR1 TSen             OK          67 degrees C / 152 degrees F
      FPC 3 XL_XR1 Chip             OK          63 degrees C / 145 degrees F
      FPC 3 XQ TSen                 OK          67 degrees C / 152 degrees F
      FPC 3 XQ Chip                 OK          63 degrees C / 145 degrees F
      FPC 3 XQ_XR0 TSen             OK          67 degrees C / 152 degrees F
      FPC 3 XQ_XR0 Chip             OK          68 degrees C / 154 degrees F
      FPC 3 XM TSen                 OK          67 degrees C / 152 degrees F
      FPC 3 XM Chip                 OK          76 degrees C / 168 degrees F
      FPC 3 XF TSen                 OK          67 degrees C / 152 degrees F
      FPC 3 XF Chip                 OK          75 degrees C / 167 degrees F
      FPC 3 PLX PCIe Switch TSe     OK          51 degrees C / 123 degrees F
      FPC 3 PLX PCIe Switch Chi     OK          54 degrees C / 129 degrees F
      FPC 3 Aloha FPGA 0 TSen       OK          51 degrees C / 123 degrees F
      FPC 3 Aloha FPGA 0 Chip       OK          70 degrees C / 158 degrees F
      FPC 3 Aloha FPGA 1 TSen       OK          51 degrees C / 123 degrees F
      FPC 3 Aloha FPGA 1 Chip       OK          75 degrees C / 167 degrees F
      FPC 5 Intake                  Testing
      FPC 5 Exhaust A               Testing
      FPC 5 Exhaust B               Testing
Fans  Top Rear Fan                  OK          Spinning at intermediate-speed
      Bottom Rear Fan               OK          Spinning at intermediate-speed
      Top Middle Fan                OK          Spinning at intermediate-speed
      Bottom Middle Fan             OK          Spinning at intermediate-speed
      Top Front Fan                 OK          Spinning at intermediate-speed
      Bottom Front Fan              OK          Spinning at intermediate-speed
```

Table 81 on page 239 lists the output fields for the `show chassis environment` command. The table lists output fields in the approximate order in which they appear.

Table 81: `show chassis environment` Output Fields

Field Name	Field Description
`Class`	Information about the category or class of chassis component: • `Temp`: Temperature of air flowing through the chassis in degrees Celsius (°C) and degrees Fahrenheit (°F) • `Fans`: Information about the status of fans and blowers
`Item`	Information about the chassis components: • Flexible PIC Concentrators (FPCs)—that is, the line cards • Control Boards (CBs) • Routing Engines • Power entry modules (PEMs)—that is, the power supplies
`Status`	Status of the specified chassis component. For example, if `Class` is `Fans`, the fan status can be: • `OK`: The fans are operational. • `Testing`: The fans are being tested during initial power-on. • `Failed`: The fans have failed or the fans are not spinning. • `Absent`: The fan tray is not installed.
`Measurement`	Depends on the Class. For example, if `Class` is `Temp`, indicates the temperature in degrees Celsius (°C) and degrees Fahrenheit (°F). If the `Class` is `Fans`, indicates actual fan RPM.

2. Issue the command `show chassis temperature-thresholds` . This command displays the chassis temperature threshold settings. The following is a sample output on an EX9208 switch. The output is similar on other EX Series switches.

`show chassis temperature-thresholds` (EX9208 Switch)

```
user@ host> show chassis temperature-thresholds
                Fan speed      Yellow alarm      Red alarm      Fire Shutdown
```

```
                (degrees C)      (degrees C)     (degrees C)      (degrees C)
Item              Normal  High   Normal  Bad fan   Normal  Bad fan     Normal
Chassis default   48    54       65       55       80       65        100
Routing Engine 0  70    80       95       95      110      110        112
FPC 3             55    60       75       65      105       80        110
FPC 5             55    60       75       65       90       80         95
```

Table 82 on page 240 lists the output fields for the `show chassis temperature-thresholds` command. The table lists output fields in the approximate order in which they appear.

Table 82: `show chassis temperature-thresholds` Output Fields

Field Name	Field Description
Item	Chassis component. You can configure the threshold information for components such as the chassis, the Routing Engines, and FPC for each slot in each FRU to display in the output. By default, information is displayed only for the chassis and the Routing Engines.
Fan speed	Temperature thresholds, in degrees Celsius, for the fans to operate at normal and at high speed. • **Normal**—The temperature threshold at which the fans operate at normal speed and when all the fans are present and functioning normally. • **High**—The temperature threshold at which the fans operate at high speed or when a fan has failed or is missing. **NOTE**: An alarm is triggered when the temperature exceeds the threshold settings for a yellow, amber, or red alarm.
Yellow or amber alarm	Temperature threshold, in degrees Celsius, that triggers a yellow or amber alarm. • **Normal**—The temperature threshold that must be exceeded on the device to trigger a yellow or amber alarm when the fans are running at full speed. • **Bad fan**—The temperature threshold that must be exceeded on the device to trigger a yellow or amber alarm when one or more fans have failed or are missing.

Table 82: `show chassis temperature-thresholds` Output Fields *(Continued)*

Field Name	Field Description
Red alarm	Temperature threshold, in degrees Celsius, that triggers a red alarm. • **Normal**—The temperature threshold that must be exceeded on the device to trigger a red alarm when the fans are running at full speed. • **Bad fan**—The temperature threshold that must be exceeded on the device to trigger a red alarm when one or more fans have failed or are missing.
Fire shutdown	Temperature threshold, in degrees Celsius, at which the switch shuts down in case of fire.

When a temperature alarm is triggered, you can identify the condition that triggered it by running the `show chassis environment` command to display the chassis temperature values for each component and comparing those with the temperature threshold values. You can display the temperature threshold values by running the `show chassis temperature-thresholds` command.

For example, for `FPC 3`:

- If the temperature of `FPC 3` exceeds 55° C, the output indicates that the fans are operating at a high speed (no alarm is triggered).
- If the temperature of `FPC 3` exceeds 65° C, a yellow alarm is triggered to indicate that one or more fans have failed.
- If the temperature of `FPC 3` exceeds 75° C, a yellow alarm is triggered to indicate that the temperature threshold limit is exceeded.
- If the temperature of `FPC 3` exceeds 80° C, a red alarm is triggered to indicate that one or more fans have failed.
- If the temperature of `FPC 3` exceeds 105° C, a red alarm is triggered to indicate that the temperature threshold limit is exceeded.
- If the temperature of `FPC 3` exceeds 110° C, the switch is powered off.

Table 83 on page 242 lists the possible causes for the switch to generate a temperature alarm. It also lists the respective remedies.

Table 83: Causes and Remedies for Temperature Alarms

Cause	Remedy
Ambient temperature is above threshold temperature.	Ensure that the ambient temperature is within the threshold temperature limit. See *Environmental Requirements and Specifications for EX Series Switches*.
Fan module or fan tray has failed.	Perform the following steps: 1. Check the fan. 2. Replace the faulty fan module or fan tray. 3. If the above two checks show no problems, open a support case using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll-free within the United States and Canada) or 1-408-745-9500 (from outside the United States).
Restricted airflow through the switch due to insufficient clearance around the installed switch.	Ensure that there is sufficient clearance around the installed switch.

Chassis Component Alarm Conditions on EX4400 Switches

In this topic, you'll learn about alarm conditions on the components installed in the EX4400 switch chassis.

Table 84 on page 242 lists the alarms that the chassis components can generate on EX4400 switches, their severity levels, and the actions you can take to respond to them.

Table 84: Alarm Conditions on EX4400 Switches

Chassis Component	Alarm Condition	Alarm Severity	Remedy
Fan modules	Fan module is not installed.	Major (red)	Install the fan module.

Table 84: Alarm Conditions on EX4400 Switches *(Continued)*

Chassis Component	Alarm Condition	Alarm Severity	Remedy
	Mix of fan modules with different airflow directions.	Major (red)	Do not mix fan modules with different directions for the airflow in the same chassis.
	Mix of fan modules and power supplies with different airflow directions.	Major (red)	Do not mix fan modules and power supplies with different directions for the airflow in the same chassis.
Power supplies	A power supply is removed from the chassis.	Major (red)	Install a power supply in the empty slot.
	The power supply is not switched on.	Minor (yellow)	Check the input connection to the power supply.
	An unknown power supply is installed.	Major (red)	Install a power supply recommended by Juniper Networks.
	Mix of power supplies with different airflow directions.	Major (red)	Do not mix power supplies with different airflow directions in the same chassis.
	Mix of fan modules and power supplies with different airflow directions.	Major (red)	Do not mix fan modules and power supplies with different airflow directions in the same chassis.
Temperature	The temperature inside the chassis reaches the yellow alarm limit.	Minor (yellow)	• Check the fan. • Open a support case using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll-free within the United States and Canada) or 1-408-745-9500 (from outside the United States).

Table 84: Alarm Conditions on EX4400 Switches *(Continued)*

Chassis Component	Alarm Condition	Alarm Severity	Remedy
	The temperature inside the chassis reaches the red alarm limit.	Major (red)	• Check the fan. • Open a support case using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll-free within the United States and Canada) or 1-408-745-9500 (from outside the United States).
	The temperature sensor has failed.	Major (red)	Open a support case using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll-free within the United States and Canada) or 1-408-745-9500 (from outside the United States).
Management Ethernet interface	Management Ethernet link is down.	Major (red)	• Check whether a cable is connected to the management Ethernet interface, or whether the cable is defective. Replace the cable if required. • If you are unable to resolve the problem, then open a support case using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll-free within the United States and Canada) or 1-408-745-9500 (from outside the United States).
Routing Engine	**/var** partition usage is high.	Minor (yellow)	Clean up the system file storage space on the switch. For more information, see *Freeing Up System Storage Space*.
	/var partition is full.	Major (red)	Clean up the system file storage space on the switch. For more information, see *Freeing Up System Storage Space*.

Table 84: Alarm Conditions on EX4400 Switches *(Continued)*

Chassis Component	Alarm Condition	Alarm Severity	Remedy
	Rescue configuration is not set.	Minor (yellow)	Use the `request system configuration rescue save` command to set the rescue configuration.
	Feature usage requires a license or the license for the feature usage has expired.	Minor (yellow)	Install the required license for the feature specified in the alarm. For more information, see *Understanding Software Licenses for EX Series Switches*.

EX4400 Switch Hardware and CLI Terminology Mapping

This topic describes the hardware terms used in EX4400 switch documentation and the corresponding terms used in the Junos OS CLI (see Table 85 on page 246 .

Table 85: CLI Equivalents of Terms Used in the Documentation for EX4400 Switches

Hardware Item (CLI)	Description (CLI)	Value	Item In Documentation	Additional Information
Chassis	One of the following: • EX4400-24T • EX4400-24P • EX4400-24MP • EX4400-24X • EX4400-48T • EX4400-48P • EX4400-48MP • EX4400-48F	-	Switch chassis	"EX4400 Models and Specifications" on page 16
Routing Engine (*n*)	One of the following: • RE-EX4400-24T • RE-EX4400-24P • RE-EX4400-24MP • RE-EX4400-24X • RE-EX4400-48T • RE-EX4400-48P • RE-EX4400-48MP • RE-EX4400-48F	*n* is a value in the range 0 through 9. • In a standalone switch, the default value is 0. • In a Virtual Chassis configuration, the values correspond to the member IDs of switches configured in the primary role and the backup role in the Virtual Chassis.	Routing Engine	-

Table 85: CLI Equivalents of Terms Used in the Documentation for EX4400 Switches *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value	Item In Documentation	Additional Information
FPC (*n*)	Abbreviated name of the Flexible PIC Concentrator (FPC) One of the following: • EX4400-24T • EX4400-24P • EX4400-24MP • EX4400-24X • EX4400-48T • EX4400-48P • EX4400-48MP • EX4400-48F	*n* is a value in the range 0 through 9. In a standalone switch, the default value is 0. In a Virtual Chassis configuration, the values correspond to the assigned member IDs of switches in the Virtual Chassis.	In this case, FPC refers to the switch itself. In this case, the FPC number refers to the member ID assigned to the switch.	Understanding Interface Naming Conventions
PIC (*n*)	Abbreviated name of the Physical Interface Card (PIC)	*n* is a value in the range 0 through 2.		Understanding Interface Naming Conventions

Table 85: CLI Equivalents of Terms Used in the Documentation for EX4400 Switches *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value	Item In Documentation	Additional Information
	One of the following: • EX4400-24T or EX4400-24P switch: `24x10M/100M/1G` • EX4400-24MP switch: `24x100M/1G/2.5G/5G/10G Base-T` • EX4400-24X switch: `24x 1G/10G SFP/SFP+` • EX4400-48T or EX4400-48P switch: `48x10M/100M/1G` • EX4400-48MP switch: `36x100M/1G/2.5G Base-T & 12x100M/1G/2.5G/5G/10G Base-T` • EX4400-48F switch: `36x1G SFP, 12x1G/10G SFP/SFP+`	PIC 0	PIC 0 stands for built-in network ports numbered **0** through **23** or **0** through **47**	"EX4400 System Overview" on page 8

Table 85: CLI Equivalents of Terms Used in the Documentation for EX4400 Switches *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value	Item In Documentation	Additional Information
	One of the following: • 2x100G QSFP28 VCP • 2x100G QSFP28 (EX4400-24X)	PIC 1	QSFP28 ports numbered 0 and 1	
	One of the following: • 4x10G SFP+ • 4x25G SFP28 • 1x100G QSFP28	PIC 2	Extension module installed in the switch	"Extension Modules in EX4400 Switches" on page 11
Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"Pluggable Transceivers and Cables Supported on EX4400 Switches" on page 124

Table 85: CLI Equivalents of Terms Used in the Documentation for EX4400 Switches *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value	Item In Documentation	Additional Information
Power supply (*n*)	One of the following: • JPSU-550-C-AC-AFO • JPSU-550-C-AC-AFI • JPSU-550-C-DC-AFO • JPSU-550-C-DC-AFI • JPSU-1050-C-AC-AFO • JPSU-1600-C-AC-AFO	*n* has a value 0 or 1, corresponding to the power supply slot number.	AC power supply or DC power supply	• "AC Power Supply in EX4400 Switches" on page 89 • "DC Power Supply in EX4400 Switches" on page 106
Fan tray	One of the following: • Fan Module, Airflow In (AFI) • Fan Module, Airflow Out (AFO)	*n* has a value 0 or 1, corresponding to the fan module slot number.	Fan module	"Cooling System and Airflow in an EX4400 Switch" on page 78

CHAPTER 7

Contact Customer Support and Return the Chassis or Components

Return an EX4400 Chassis or Components

IN THIS SECTION

How to Return an EX4400 Switch or Component for Repair or Replacement

If you need to return a switch or hardware component to Juniper Networks for repair or replacement, follow this procedure:

1. Determine the serial number of the chassis if you need to return the switch. If you need to return one or more components, determine the serial number for each component. For instructions, see "Locate the Serial Number on an EX4400 Switch or Component" on page 253 .
2. Obtain a Return Material Authorization (RMA) number from Juniper Networks Technical Assistance Center (JTAC) as described in "Contact Customer Support to Obtain a Return Material Authorization" on page 263 .

   NOTE: Do not return any component to Juniper Networks unless you have first obtained an RMA number. Juniper Networks reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer through collect freight.

3. Pack the switch or component for shipping as described in "Pack an EX4400 Switch or Component for Shipping" on page 264 .

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

Locate the Serial Number on an EX4400 Switch or Component

IN THIS SECTION

If you are returning a switch or hardware component to Juniper Networks for repair or replacement, you must locate the serial number of the switch or component. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain Return Material Authorization (RMA).

If the switch is operational and you can access the CLI, you can list serial numbers for the switch and for some components with a CLI command. If you do not have access to the CLI or if the serial number for the component does not appear in the command output, you can locate the serial number ID label on the physical switch or component.

NOTE: If you want to find the serial number on the physical switch component, you will need to remove the component from the switch chassis, for which you must have the required parts and tools available.

List the Switch and Components Details with the CLI

To list the switch and switch components and their serial numbers, enter the CLI command `show chassis hardware extensive`.

The following output lists the switch components and serial numbers for an EX4400-48F switch. The output is similar for the other models.

```
user@switch> show chassis hardware extensive
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                YK4319500020      EX4400-48F
 Jedec Code:   0x0000           EEPROM Version:    0x00
                                S/N:               YK4319500020
 Assembly ID:  0xf000           Assembly Version:  00.00
```

```
 Date:         00-00-0000        Assembly Flags:    0x00
 Board Information Record:
  Address 0x00: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 I2C Hex Data:
  Address 0x00: 00 00 00 00 f0 00 00 00 00 00 00 00 00 00 00 00
  Address 0x10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x20: 59 4b 34 33 31 39 35 30 30 30 32 30 00 00 00 00
  Address 0x30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x40: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x50: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Pseudo CB 1
Routing Engine 1          BUILTIN      BUILTIN           RE-EX4400-48F
 Jedec Code:   0x7fb0            EEPROM Version:    0x02
 P/N:          BUILTIN           S/N:               BUILTIN
 Assembly ID:  0xf010            Assembly Version:  01.01
 Date:         12-19-2019        Assembly Flags:    0x00
                                 CLEI Code:         DUMMY_CLEI
                                 FRU Model Number:  EX4400-48F-S
 Board Information Record:
  Address 0x00: ad ff 80 00 c0 bf a7 00 eb a0 ff ff ff ff ff ff
 I2C Hex Data:
  Address 0x00: 7f b0 02 fc f0 10 01 01 00 00 00 00 00 00 00 00
  Address 0x10: 00 00 00 00 42 55 49 4c 54 49 4e 00 00 00 00 00
  Address 0x20: 42 55 49 4c 54 49 4e 00 00 00 00 00 00 13 0c 07
  Address 0x30: e3 ff ff ff ad ff 80 00 c0 bf a7 00 eb a0 ff ff
  Address 0x40: ff ff ff ff 01 44 55 4d 4d 59 5f 43 4c 45 49 45
  Address 0x50: 58 34 34 30 30 2d 34 38 46 2d 53 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
  Address 0x70: ff ff ff f4 59 4b 34 33 31 39 35 30 30 30 32 30
FPC 1            REV 01   650-114385   YK4319500020      EX4400-48F
 Jedec Code:   0x7fb0            EEPROM Version:    0x02
 P/N:          650-114385        S/N:               YK4319500020
 Assembly ID:  0x0d5c            Assembly Version:  01.01
 Date:         12-19-2019        Assembly Flags:    0x00
 Version:      REV 01            CLEI Code:         DUMMY_CLEI
 ID: EX4400-48F                  FRU Model Number:  EX4400-48F-S
 Board Information Record:
  Address 0x00: ad ff 80 00 c0 bf a7 00 eb a0 ff ff ff ff ff ff
 I2C Hex Data:
  Address 0x00: 7f b0 02 fc 0d 5c 01 01 52 45 56 20 30 31 00 00
  Address 0x10: 00 00 00 00 36 35 30 2d 31 31 34 33 38 35 00 00
```

```
 Address 0x20: 59 4b 34 33 31 39 35 30 30 30 32 30 00 13 0c 07
 Address 0x30: e3 ff ff ff ad ff 80 00 c0 bf a7 00 eb a0 ff ff
 Address 0x40: ff ff ff ff 01 44 55 4d 4d 59 5f 43 4c 45 49 45
 Address 0x50: 58 34 34 30 30 2d 34 38 46 2d 53 00 00 00 00 00
 Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
 Address 0x70: ff ff ff f4 59 4b 34 33 31 39 35 30 30 30 32 30
 CPU                    BUILTIN      BUILTIN           FPC CPU
Jedec Code:   0x7fb0            EEPROM Version:    0x02
P/N:          BUILTIN           S/N:               BUILTIN
Assembly ID:  0xf020            Assembly Version:  01.01
Date:         12-19-2019        Assembly Flags:    0x00
Board Information Record:
 Address 0x00: ad ff 80 00 c0 bf a7 00 eb a0 ff ff ff ff ff ff
I2C Hex Data:
 Address 0x00: 7f b0 02 fc f0 20 01 01 00 45 56 20 30 31 00 00
 Address 0x10: 00 00 00 00 42 55 49 4c 54 49 4e 00 38 35 00 00
 Address 0x20: 42 55 49 4c 54 49 4e 00 30 30 32 30 00 13 0c 07
 Address 0x30: e3 ff ff ff ad ff 80 00 c0 bf a7 00 eb a0 ff ff
 Address 0x40: ff ff ff ff 00 44 55 4d 4d 59 5f 43 4c 45 49 45
 Address 0x50: 58 34 34 30 30 2d 34 38 46 2d 53 00 00 00 00 00
 Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
 Address 0x70: ff ff ff f4 59 4b 34 33 31 39 35 30 30 30 32 30
 PIC 0          REV 01   BUILTIN      BUILTIN           36x 1G SFP, 12x 1G/10G SFP/SFP+
Jedec Code:   0x7fb0            EEPROM Version:    0x02
P/N:          BUILTIN           S/N:               BUILTIN
Assembly ID:  0xf050            Assembly Version:  01.01
Date:         12-19-2019        Assembly Flags:    0x00
Version:      REV 01            CLEI Code:         DUMMY_CLEI
                                FRU Model Number:  EX4400-48F-S
Board Information Record:
 Address 0x00: ad ff 80 00 c0 bf a7 00 eb a0 ff ff ff ff ff ff
I2C Hex Data:
 Address 0x00: 7f b0 02 fc f0 50 01 01 52 45 56 20 30 31 00 00
 Address 0x10: 00 00 00 00 42 55 49 4c 54 49 4e 00 38 35 00 00
 Address 0x20: 42 55 49 4c 54 49 4e 00 30 30 32 30 00 13 0c 07
 Address 0x30: e3 ff ff ff ad ff 80 00 c0 bf a7 00 eb a0 ff ff
 Address 0x40: ff ff ff ff 01 44 55 4d 4d 59 5f 43 4c 45 49 45
 Address 0x50: 58 34 34 30 30 2d 34 38 46 2d 53 00 00 00 00 00
 Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
 Address 0x70: ff ff ff f4 55 55 55 55 55 55 55 55 55 55 55 55
   Xcvr 0       REV 01   740-021487   JCG2007567        SFP-FX-PHY
   Xcvr 1       REV 01   740-021487   JCG2007472        SFP-FX-PHY
   Xcvr 2       REV 02   740-011613   N2PARS2           SFP-SX
```

```
    Xcvr 3               NON-JNPR     FCCODQT64000097   SFP-T
    Xcvr 4               NON-JNPR     UVK0XK0           SFP28-25G-BASE-SR
    Xcvr 5       REV 01  740-011614   AC1621SA1F7       SFP-LX10
    Xcvr 6               NON-JNPR     FCCODQT64000098   SFP-T
    Xcvr 7       REV 01  740-032293   P2PAXFD           SFP-LH
    Xcvr 8       REV 02  740-014132   PPL6B1E           SFP-T
    Xcvr 9               NON-JNPR     AD1601304UB       DUAL-SFP+-SR/SFP-SX
    Xcvr 10      0       NON-JNPR     0501280230035763  SFP-SX
    Xcvr 11      REV 01  740-032291   P2PAXEK           SFP-LH
    Xcvr 12              NON-JNPR                       UNSUPPORTED
    Xcvr 13      REV 01  740-021308   CF34KM169         SFP+-10G-SR
    Xcvr 15              NON-JNPR     A06C7WK           DUAL-SFP+-SR/SFP-SX
    Xcvr 18      REV 01  740-032292   P2PAW6N           SFP-LH
    Xcvr 19      REV 01  740-030658   ASL1HV6           SFP+-10G-USR
    Xcvr 21      REV 01  740-030128   A1LAS9C           SFP+-10G-ER
    Xcvr 22      REV 01  740-021308   ALD15Z3           SFP+-10G-SR
    Xcvr 23      REV 01  740-021308   09T511103738      SFP+-10G-SR
    Xcvr 25              NON-JNPR     A06BV81           DUAL-SFP+-SR/SFP-SX
    Xcvr 26      REV 01  740-021309   AD0912LE01W       SFP+-10G-LR
    Xcvr 27      REV 01  740-011614   C08A06993         SFP-LX10
    Xcvr 28      REV 02  740-011613   PPM47Q1           SFP-SX
    Xcvr 32      REV 01  740-031981   AD1709501W3       SFP+-10G-LR
    Xcvr 33      REV 01  740-021309   UGM01T8           SFP+-10G-LR
    Xcvr 34      REV 01  740-032295   P2PAK8C           SFP-LH
    Xcvr 41      REV 01  740-021309   JCK2004644        SFP+-10G-LR
    Xcvr 42      REV 01  740-021309   JCL2001937        SFP+-10G-LR
    Xcvr 43      REV 01  740-021309   JCK2004690        SFP+-10G-LR
    Xcvr 44      REV 01  740-021309   N2HBGBE           SFP+-10G-LR
    Xcvr 46      REV 01  740-021309   N2GC5QB           SFP+-10G-LR
 PIC 1           REV 01  650-114385   YK4319500020      2x100G QSFP28
Jedec Code:   0x7fb0           EEPROM Version:    0x02
P/N:          650-114385       S/N:               YK4319500020
Assembly ID:  0xf051           Assembly Version:  01.01
Date:         12-19-2019       Assembly Flags:    0x00
Version:      REV 01           CLEI Code:         DUMMY_CLEI
                               FRU Model Number:  EX4400-48F-S
Board Information Record:
 Address 0x00: ad ff 80 00 c0 bf a7 00 eb a0 ff ff ff ff ff ff
I2C Hex Data:
 Address 0x00: 7f b0 02 fc f0 51 01 01 52 45 56 20 30 31 00 00
 Address 0x10: 00 00 00 00 36 35 30 2d 31 31 34 33 38 35 00 00
 Address 0x20: 59 4b 34 33 31 39 35 30 30 30 32 30 00 13 0c 07
 Address 0x30: e3 ff ff ff ad ff 80 00 c0 bf a7 00 eb a0 ff ff
```

```
  Address 0x40: ff ff ff ff 01 44 55 4d 4d 59 5f 43 4c 45 49 45
  Address 0x50: 58 34 34 30 30 2d 34 38 46 2d 53 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
  Address 0x70: ff ff ff f4 55 55 55 55 55 55 55 55 55 55 55 55
    Xcvr 0       REV 01   740-061000   1RC4044807P       QSFP28-100G-CU1M
    Xcvr 1       REV 01   740-061001   1RC424480CC       QSFP28-100G-CU3M
  PIC 2          REV 01   650-107358   YP4319450014      4x10G SFP+
 Jedec Code:   0x7fb0            EEPROM Version:    0x02
 P/N:          650-107358        S/N:               YP4319450014
 Assembly ID:  0xf052            Assembly Version:  01.01
 Date:         11-07-2019        Assembly Flags:    0x00
 Version:      REV 01            CLEI Code:         DUMMYCLEI
                                 FRU Model Number:  EX4350-48F
 Board Information Record:
  Address 0x00: ad 01 80 00 0c 00 00 00 00 00 ff ff ff ff ff ff
 I2C Hex Data:
  Address 0x00: 7f b0 02 fe f0 52 01 01 52 45 56 20 30 31 00 00
  Address 0x10: 00 00 00 00 36 35 30 2d 31 30 37 33 35 38 00 00
  Address 0x20: 59 50 34 33 31 39 34 35 30 30 31 34 00 07 0b 07
  Address 0x30: e3 ff ff ff ad 01 80 00 0c 00 00 00 00 00 ff ff
  Address 0x40: ff ff ff ff 01 44 55 4d 4d 59 43 4c 45 49 00 45
  Address 0x50: 58 34 33 35 30 2d 34 38 46 00 00 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 31 00 00 ff ff ff ff ff ff ff
  Address 0x70: ff ff ff 19 55 55 55 55 55 55 55 55 55 55 55 55
    Xcvr 0       REV 01   740-084670   1A1C5GA45101A     SFP28-25G-BASE-AOC-20M
    Xcvr 1       REV 01   740-084670   1A1C5GA45101A     SFP28-25G-BASE-AOC-20M
    Xcvr 2       58C 19   NON-JNPR     CN746EK142        SFP-SX
    Xcvr 3       REV 02   740-011613   AM0943SEKDD       SFP-SX
Power Supply 0   REV 00   640-107107   1EHB9410229       JPSU-550-C-AC-AFO
 Jedec Code:   0x7fb0            EEPROM Version:    0x02
 P/N:          640-107107        S/N:               1EHB9410229
 Assembly ID:  0x04d2            Assembly Version:  00.00
 Date:         10-25-2019        Assembly Flags:    0x00
 Version:      REV 00            CLEI Code:         DUMMY CLEI
 ID: JPSU-550-C-AC-AFO
 Board Information Record:
  Address 0x00: b0 01 ff ff ff ff ff ff ff ff ff ff 00 04 00 ff
 I2C Hex Data:
  Address 0x00: 7f b0 02 ff 04 d2 00 00 52 45 56 20 30 30 00 00
  Address 0x10: 00 00 00 00 36 34 30 2d 31 30 37 31 30 37 00 00
  Address 0x20: 31 45 48 42 39 34 31 30 32 32 39 00 00 19 0a 07
  Address 0x30: e3 ff ff ff b0 01 ff ff ff ff ff ff ff ff ff ff
  Address 0x40: 00 04 00 ff 01 44 55 4d 4d 59 20 43 4c 45 49 00
```

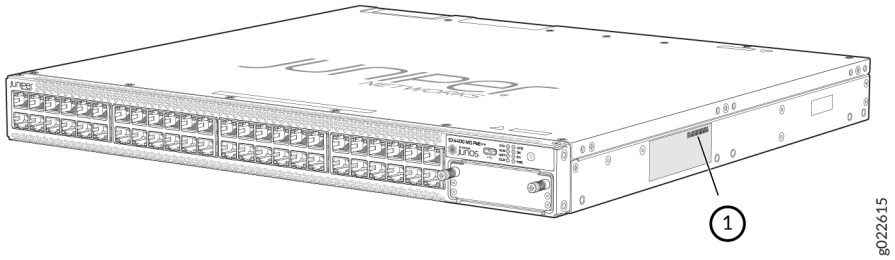
```
  Address 0x50: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 41 30 30 ff ff ff ff ff ff ff
  Address 0x70: ff ff ff 61 ff ff ff ff ff ff ff ff ff ff ff ff
Fan Tray 0                                              Fan Module, Airflow Out (AFO)
 Jedec Code:   0x7fb0           EEPROM Version:    0x00
 Assembly ID:  0xf040           Assembly Version:  00.00
 Date:         00-00-0000       Assembly Flags:    0x00
 Board Information Record:
  Address 0x00: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 I2C Hex Data:
  Address 0x00: 7f b0 00 00 f0 40 00 00 00 00 00 00 00 00 00 00
  Address 0x10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x40: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x50: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Fan Tray 1                                              Fan Module, Airflow Out (AFO)
 Jedec Code:   0x7fb0           EEPROM Version:    0x00
 Assembly ID:  0xf040           Assembly Version:  00.00
 Date:         00-00-0000       Assembly Flags:    0x00
 Board Information Record:
  Address 0x00: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 I2C Hex Data:
  Address 0x00: 7f b0 00 00 f0 40 00 00 00 00 00 00 00 00 00 00
  Address 0x10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x40: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x50: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x60: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  Address 0x70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

For information about the `show chassis hardware` command, see *show chassis hardware*.

Locate the Chassis Serial Number ID Label on an EX4400 Switch

The serial number ID label is located on the right-hand side panel of the chassis on EX4400 switches (see Figure 136 on page 259).

Figure 136: Location of the Serial Number ID Label on EX4400 Switches



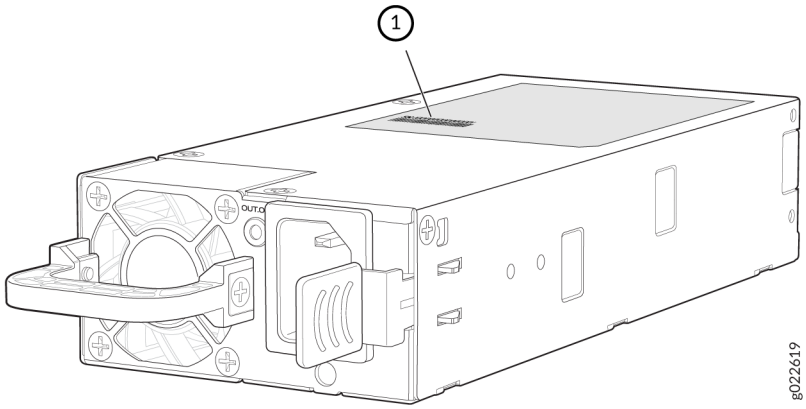
1– Serial Number ID Label

Locate the Serial Number ID Labels on FRUs in an EX4400 Switch

The power supplies, fan modules, and extension modules installed in EX4400 switches are field-replaceable units (FRUs). You must remove the FRU from the switch chassis to see its serial number ID label.

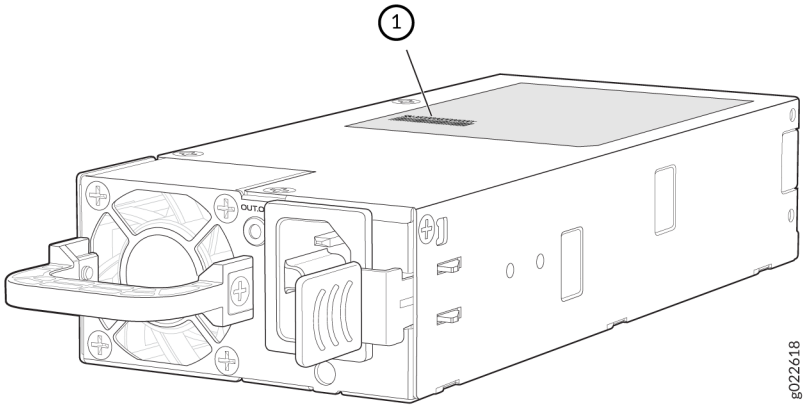
- *Power supply*—The serial number ID label is on the top of the power supply (see Figure 137 on page 259 , Figure 138 on page 260 , Figure 139 on page 260 , and Figure 140 on page 261).

Figure 137: Location of the Serial Number ID Label on the 550-W AC Power Supply Used in EX4400 Switches



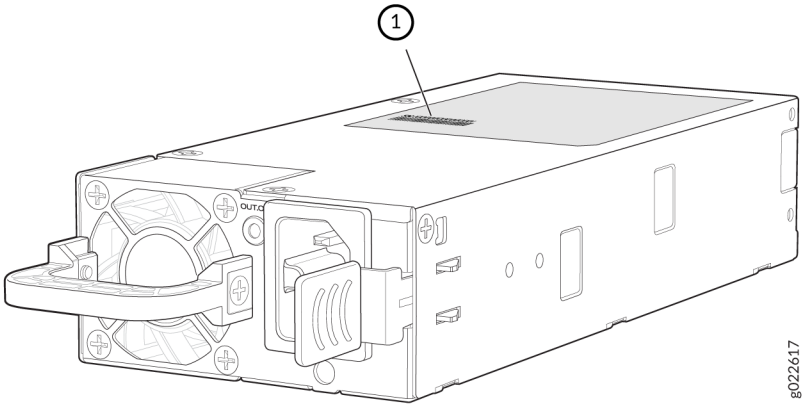
1– Serial Number ID Label

Figure 138: Location of the Serial Number ID Label on the 1050-W AC Power Supply Used in EX4400 Switches



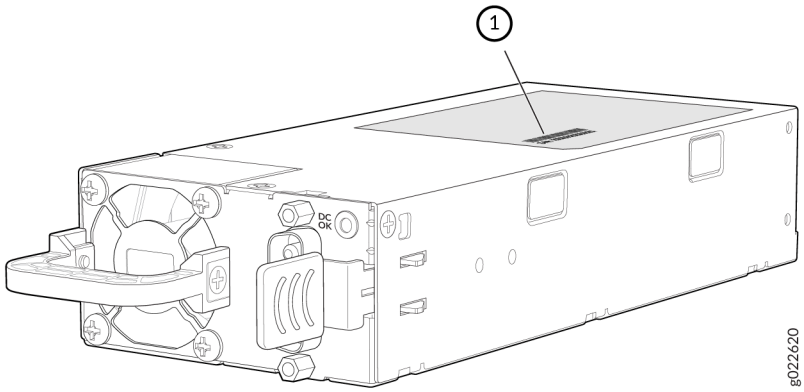
1– Serial Number ID Label

Figure 139: Location of the Serial Number ID Label on the 1600-W AC Power Supply Used in EX4400 Switches



1– Serial Number ID Label

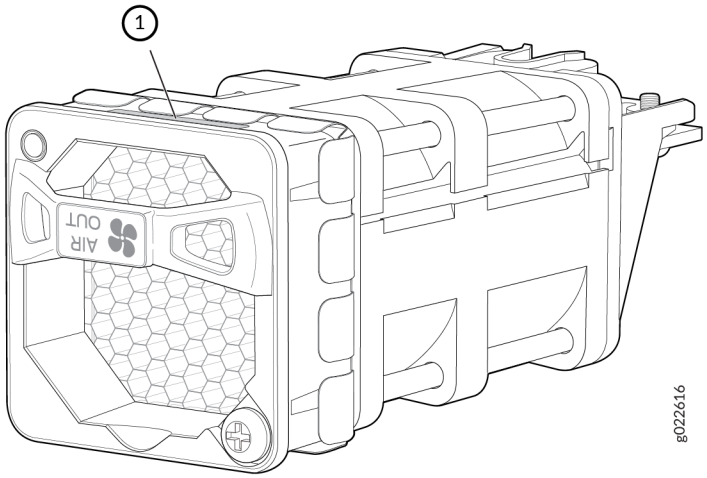
Figure 140: Location of the Serial Number ID Label on a DC Power Supply Used in EX4400 Switches



1– Serial Number ID Label

- *Fan module*—The serial number ID label is on the top of the fan module (see Figure 141 on page 261).

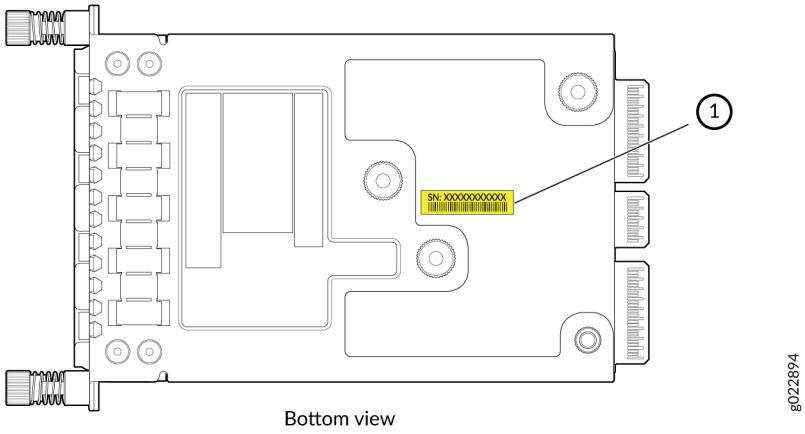
Figure 141: Location of the Serial Number ID Label on the Fan Module Used in EX4400 Switches



1– Serial Number ID Label

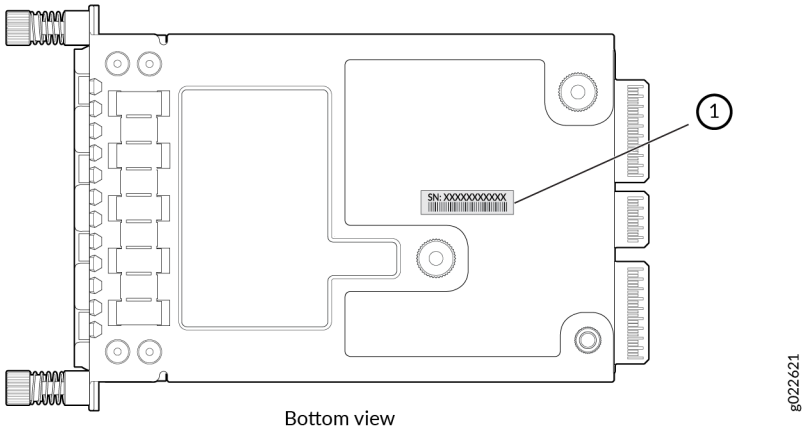
- *Extension module*—The serial number ID label is on the top of the extension module (see Figure 142 on page 262 , Figure 143 on page 262 , and Figure 144 on page 263).

Figure 142: Location of the Serial Number ID Label on the 1x100GbE QSFP28 Extension Module Used in EX4400 Switches



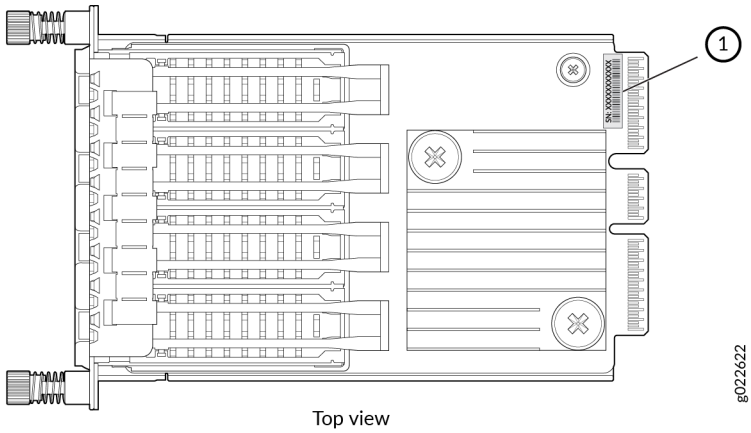
1–	Serial Number ID Label

Figure 143: Location of the Serial Number ID Label on a 4x10GbE SFP+ Extension Module Used in EX4400 Switches



1–	Serial Number ID Label

Figure 144: Location of the Serial Number ID Label on a 4x25GbE SFP28 Extension Module Used in EX4400 Switches



Top view

1– Serial Number ID Label

Contact Customer Support to Obtain a Return Material Authorization

If you need to return a device or hardware component to Juniper Networks for repair or replacement, obtain a Return Material Authorization (RMA) number from Juniper Networks Technical Assistance Center (JTAC). You must obtain an RMA number before you attempt to return the component.

After locating the serial number of the device or hardware component you want to return, open a service request with the Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

Before you request an RMA number from JTAC, be prepared to provide the following information:

- Your existing service request number, if you have one
- Serial number of the component
- Your name, organization name, telephone number, fax number, and shipping address
- Details of the failure or problem
- Type of activity being performed on the device when the problem occurred
- Configuration data displayed by one or more `show` commands

You can contact JTAC 24 hours a day, seven days a week on the Web or by telephone:

- Service Request Manager: https://support.juniper.net/support
- Telephone: +1-888-314-JTAC (+1-888-314-5822), toll free in U.S., Canada, and Mexico

NOTE: For international or direct-dial options in countries without toll free numbers, see https://support.juniper.net/support.

If you are contacting JTAC by telephone, enter your 12-digit service request number followed by the pound (#) key for an existing case, or press the star (*) key to be routed to the next available support engineer.

The support representative validates your request and issues an RMA number for return of the component.

Pack an EX4400 Switch or Component for Shipping

IN THIS SECTION

If you are returning an EX4400 switch or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack the switch or component, ensure that you have:

- Followed all the steps listed in "Contact Customer Support to Obtain a Return Material Authorization" on page 263 .
- Retrieved the original shipping carton and packing materials. Contact your JTAC representative if you do not have these materials, to learn about approved packing materials (see "Contact Customer Support to Obtain a Return Material Authorization" on page 263).
- Ensure that you understand how to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- An ESD grounding strap—not provided

Pack an EX4400 Switch for Shipping

Before you pack the switch:

1. On the console or other management device connected to the switch, enter the CLI operational mode and issue the following command to shut down the switch software:

   ```
   user@switch> request system halt
   ```

   Wait until a message appears on the console confirming that the operating system has halted.

2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.

3. Disconnect power from the switch.

4. Remove the cables that connect the switch to external devices.

5. Remove all optical transceivers installed in the switch.

Ensure that you have the following parts and tools:

- Number 2 Phillips (+) screwdriver—not provided
- The original switch packing material (cardboard box, accessory box and its contents, and foam padding)
- An ESD grounding strap—not provided
- Antistatic bag—not provided

If you need to transport the switch to another location or return the switch to Juniper Networks, you need to pack the switch securely in its original packaging to prevent damage during transportation.

CAUTION: Do not pack the switch in anything except its original container, or the switch might be damaged in transit.

To pack the switch:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. If the switch is installed in a rack or cabinet, have one person support the weight of the switch while another person unscrews and removes the mounting screws.
3. Remove the switch from the rack or cabinet and place the switch on a flat, stable surface.
4. Use the screwdriver to remove the rack mounting brackets from the switch chassis.

5. Place the switch in an antistatic bag.
6. Place the bottom portion of the packaging foam in the shipping carton.
7. Place the switch inside the cavity in the bottom packaging foam.
8. Place the top portion of the packaging foam on top of the switch.
9. If you are returning accessories or field-replaceable units (FRUs) with the switch, pack them as instructed in "Pack EX4400 Switch Components for Shipping" on page 266
10. Place the accessory box by the rear end of the chassis in the shipping carton.
11. Close the top of the cardboard shipping box and seal it with packing tape.
12. Write the RMA number on the exterior of the box to ensure proper tracking.

Pack EX4400 Switch Components for Shipping

Ensure that you have the following parts and tools available:

- Antistatic bag, one for each component—not provided
- An ESD grounding strap—not provided

If you need to transport a switch component to another location or return a component to Juniper Networks, you need to pack the component securely in its original packaging to prevent damage during transportation.

CAUTION: Do not stack switch components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

To pack the switch components:

- Place individual components in antistatic bags.
- Use the original packing materials if they are available. If the original packing materials are not available, ensure the component is adequately packed to prevent damage during transit. The packing material you use must be able to support the weight of the component.
- Ensure that the components are adequately protected by wrapping them well with packing materials. Pack the component in an oversized box (if the original box is not available) with extra packing material around the unit so that the component is prevented from moving around inside the box.
- Securely tape the box closed.
- Write the RMA number on the exterior of the box to ensure proper tracking.

CHAPTER 8

Safety and Compliance Information

Safety Information for EX4400

The Juniper Networks Safety Guide provides general safety information and guidelines for all Juniper Networks products. Follow the guidelines provided in the guide to reduce the likelihood of personal injury, equipment damage, and damage to surrounding areas.

Along with the information provided in the Juniper Networks Safety Guide, you must read and understand the *EX4400* specific safety information provided in this hardware guide.

AC Power Electrical Safety Guidelines for EX4400 Switches

The following electrical safety guidelines apply to AC-powered devices:

- Note the following warnings printed on the device:

  "**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK."

  "**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE."

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.

- You must provide an external certified circuit breaker (2-pole circuit breaker on your device current rating) rated minimum 13 A, 16 A, or 20 A in the building installation or as per local electrical code.

- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.

- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

Power Cable Warning (Japanese)

WARNING: The attached power cable is only for this product. Do not use the cable for another product.

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

DC Power Electrical Safety Guidelines for EX4400 Switches

- For permanently connected equipment, a readily accessible disconnect device shall be incorporated external to the equipment.
- For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.
- Be sure to connect the ground wire or conduit to a solid central office earth ground.
- A closed loop ring is recommended for terminating the ground conductor at the ground stud.
- Run two wires from the circuit breaker box to a source of 48 VDC.
- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.
- Provide a 20 A 2-pole breaker or a circuit breaker as per local electrical code.

NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker must protect against excess currents, short circuits, and earth grounding faults in accordance with NEC ANSI/NFPA 70.

Agency Approvals for EX4400 Switches

IN THIS SECTION

EX4400 complies with the following standards:

- Safety
  - IEC 60950-1:2005,AMD1:2009, AMD2:2013 Information Technology Equipment – Safety
  - UL 60950-1:2007 R10.14 Information Technology Equipment – Safety
  - CAN/CSA-C22.2 No. 60950-1-07, Amd 1:2011, Amd 2:2014 Information Technology Equipment – Safety
  - IEC 62368-1 Audio/Video, Information and Communication Technology Equipment
  - EN 62368-1:2014+A11:2017 Audio/Video, Information and Communication Technology Equipment
  - UL/CSA 62368-1 Audio/Video, Information and Communication Technology Equipment
  - IEC/EN 60825-1 Safety of Laser Products – Part 1: Equipment classification and requirements
- EMC
  - Emission Tests
    - EN 55032:2015 +A1:2020, Class A
    - CISPR 32:2015 +A1:2019, Class A
    - EN55022:2010, Class A
    - CISPR22:2008, Class A
    - Australian Communications and Media Authority (ACMA) AS/NZS CISPR 32: 2015, Class A
    - FCC Part 15, Sub part B, for Class A digital devices
    - Innovation, Science and Economic Development Canada ICES 003, dated January 2016, Class A

    - VCCI-CISPR32:2016 Regulations For Voluntary Control Measures of radio interference generated by Information Technology Equipment, VCCI CISPR32: 2016 (Class A)
    - BSMI CNS 13438 Taiwan Radiated and Conducted Emissions (at 10 Meter)
    - KN32 Korea Radiated Emission Characteristics (at 10 Meter)
    - EN 300 386, V1.6.1 (2012-09), Class A
    - EN 300386 V2.1.1 (2016-07), Class A
    - TEC/SD/DD/EMC-221/05/OCT-16, Class A
    - CVN 7189:2009 “Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement” Class A
  - Immunity Tests
    - EN 300 386, V1.6.1 (2012-09)
    - EN 300386 V2.1.1 (2016-07)
    - TEC/SD/DD/EMC-221/05/OCT-16
    - EN55035:2017
    - CISPR24:2010
    - EN 55024:2010
    - CISPR35:2016
    - TCVN7317:2003
    - KN35 Korea Radiated Immunity Characteristics
- Energy Efficiency Requirements
  - AT&T TEER (ATIS-06000015.03.2013)
  - ECR 3.0.1
  - ETSI ES 203 136 (2013-05)
  - Verizon TEEER (VZ.TPR.9205 Issue 6)

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements for EX4400 Switches

IN THIS SECTION

Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service can be extended by means of a certified connector assembly. The customer should be

aware that compliance with the above conditions might not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, might give the telecommunications company cause to request the user to disconnect the equipment.

CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution might be particularly important in rural areas.

CAN ICES-003(A) / NMB-003(A)

Taiwan

此為甲類資訊技術設備。於一般家居環境使用時，本設備可能導致射頻干擾，用□請採取相應措施。

The preceding translates as follows:

This is a Class A device. In a domestic environment, this device might cause radio interference, in which case the user needs to take adequate measures.

European Community

This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

Israel

אזהרה

מוצר זה הוא מוצר Class A.
בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה ,המשתמש עשוי להידרש לנקוט אמצעים מתאימים.

The preceding translates as follows:

Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The preceding translates as follows:

This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

VCCI-A

Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Korean Class A Warning g040913

The preceding translates as follows:

This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

United States

The device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users need to correct the interference at their own expense.

FCC Part 15 Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, might cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for help.

Acoustic Noise for EX4400 Switches

Table 86 on page 276 lists the typical acoustic noise measurements for EX4400 switch models taken from the front of the chassis at 23° C, in compliance with ISO 7779.

Table 86: Typical Acoustic Noise for EX4400 Switches

Switch Model	Power Supply or Power Supplies Installed	Typical Acoustic Noise in dB(A)
EX4400-24T	One 550-W AC power supply with front-to-back airflow	42.7
	One 550-W AC power supply with back-to-front airflow	46.08
	One 550-W DC power supply with front-to-back airflow	42.59
	One 550-W DC power supply with back-to-front airflow	46.19
	Two 550-W AC power supplies with front-to-back airflow	41.68
	Two 550-W AC power supplies with back-to-front airflow	46.03
	Two 550-W DC power supplies with front-to-back airflow	42.54
	Two 550-W DC power supplies with back-to-front airflow	46.54
EX4400-24P	One 1050-W AC power supply with front-to-back airflow	44.45
	Two 1050-W AC power supplies with front-to-back airflow	44.23
	One 1600-W AC power supply with front-to-back airflow	48.8
	Two 1600-W AC power supplies with front-to-back airflow	48.1
EX4400-24MP	One 1050-W AC power supply with front-to-back airflow	46.11

Table 86: Typical Acoustic Noise for EX4400 Switches *(Continued)*

Switch Model	Power Supply or Power Supplies Installed	Typical Acoustic Noise in dB(A)
	Two 1050-W AC power supplies with front-to-back airflow	46.43
	One 1600-W AC power supply with front-to-back airflow	48.71
	Two 1600-W AC power supplies with front-to-back airflow	47.68
EX4400-24X	One 550-W AC power supply with front-to-back airflow	42.71
	One 550-W AC power supply with back-to-front airflow	45.79
	One 550-W DC power supply with front-to-back airflow	43.32
	One 550-W DC power supply with back-to-front airflow	46.62
	Two 550-W AC power supplies with front-to-back airflow	42.24
	Two 550-W AC power supplies with back-to-front airflow	46.18
	Two 550-W DC power supplies with front-to-back airflow	42.86
	Two 550-W DC power supplies with back-to-front airflow	47.39
EX4400-48T	One 550-W AC power supply with front-to-back airflow	42.32
	One 550-W AC power supply with back-to-front airflow	44.78
	One 550-W DC power supply with front-to-back airflow	42.72
	One 550-W DC power supply with back-to-front airflow	44.6

Table 86: Typical Acoustic Noise for EX4400 Switches *(Continued)*

Switch Model	Power Supply or Power Supplies Installed	Typical Acoustic Noise in dB(A)
	Two 550-W AC power supplies with front-to-back airflow	42.87
	Two 550-W AC power supplies with back-to-front airflow	44.64
	Two 550-W DC power supplies with front-to-back airflow	42.73
	Two 550-W DC power supplies with back-to-front airflow	44.72
EX4400-48P	One 1600-W AC power supply with front-to-back airflow	44.78
	Two 1600-W AC power supplies with front-to-back airflow	44.68
EX4400-48MP	One 1600-W AC power supply with front-to-back airflow	44.16
	Two 1600-W AC power supplies with front-to-back airflow	44.5
EX4400-48F	One 550-W AC power supply with front-to-back airflow	43.23
	One 550-W AC power supply with back-to-front airflow	44.91
	One 550-W DC power supply with front-to-back airflow	43.71
	One 550-W DC power supply with back-to-front airflow	44.93
	Two 550-W AC power supplies with front-to-back airflow	43.35
	Two 550-W AC power supplies with back-to-front airflow	44.79
	Two 550-W DC power supplies with front-to-back airflow	43.69

Table 86: Typical Acoustic Noise for EX4400 Switches *(Continued)*

Switch Model	Power Supply or Power Supplies Installed	Typical Acoustic Noise in dB(A)
	Two 550-W DC power supplies with back-to-front airflow	44.61